INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS

COMMISSION INTERNATIONALE POUR LA CONSERVATION DES THONIDÉS DE L'ATLANTIQUE

ICCAT - CICTA - CICAA

COMISIÓN INTERNACIONAL PARA LA CONSERVACIÓN DEL ATÚN ATLÁNTICO

# REPORT OF THE STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)

## (Madrid, Spain, October 4-8, 2010)

**October 2010**

Corazón de María, 8 – 28002 MADRID – Spain, Espagne, España – Tel: +34 91 416 56 00 – Fax+34 91 415 26 12 – http://www.iccat.int - info@iccat.int

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*(Madrid, Spain – October 4 to 8, 2010)*

## 1. Opening of the meeting

The 2010 Meeting of the Standing Committee on Research and Statistics (SCRS) was opened on Monday, October 4 at the Hotel Velázquez in Madrid by Dr. Gerald Scott, Chairman of the Committee. Dr. Scott welcomed all the participants to the annual meeting.

The ICCAT Executive Secretary Mr. Driss Meski, addressed the meeting and welcomed all the participants to Madrid. In his opening address, Mr. Meski expressed appreciation to the Kingdom of Spain for its valuable contributions to and collaboration with the Secretariat. The SCRS is tasked with a special mandate to ensure the recovery and sustainable exploitation of stocks, a task that is followed closely by fishery experts throughout the world. This work means that ICCAT is considered as one of the major Regional Fishery Management Organizations (RFMOs) in the world. The Executive Secretary's opening address is attached as **Appendix 4**.

## 2. Adoption of Agenda and arrangements for the meeting

The Tentative Agenda was reviewed and adopted (attached as **Appendix 1**). Stock assessments were carried out this year on bluefin tuna (BFT), bigeye tuna (BET), and Mediterranean swordfish (SWO-Med).

The following scientists served as rapporteurs of the various species sections (Agenda Item 8) of the 2010 SCRS Report.

| | |
|---|---|
| Tropical tunas- General | J. Pereira |
| YFT - Yellowfin tuna | C. Brown |
| BET - Bigeye tuna | D. Die |
| SKJ - Skipjack tuna | D. Gaertner |
| ALB - Albacore | V. Ortiz de Zarate |
| BFT - Bluefin tuna | C. Porch (W), J.M. Fromentin (E) |
| BIL - Billfishes | F. Arocha |
| SWO - Swordfish | J. Neilson, P. Travassos (Atl.), G. Tserpes (Med.) |
| SBF - Southern bluefin | |
| SMT - Small tunas | J. Ortiz de Urbina |
| SHK - Sharks | A. Domingo |

The Secretariat served as rapporteur for all other Agenda items.

## 3. Introduction of Contracting Party delegations

The Executive Secretary introduced the 20 Contracting Parties present at the 2010 meeting: Angola, Brazil, Canada, Cape Verde, China, Côte d'Ivoire, Croatia, European Union, Ghana, Japan, Korea, Mauritania, Mexico, Morocco, Norway, Russian Federation, Senegal, United Kingdom (Overseas Territories), United States and Uruguay. The List of Participants at the Species Groups Meetings and the Plenary Sessions is attached as **Appendix 2**.

**4. Introduction and admission of observers**

Representatives from the following Cooperating Entity (Chinese Taipei), intergovernmental organizations (General Fisheries Commission for the Mediterranean-GFCM), and non-governmental organizations (Federation of Maltese Aquaculture Producers-FEAP, Greenpeace, International Seafood Sustainability Foundation-ISSF, The Pew Environmental Group, and World Wide Fund for Nature-WWF were admitted as observers and welcomed to the 2010 SCRS (see **Appendix 2**).

**5. Admission of scientific documents**

The Secretariat informed the Committee that 145 scientific papers had been submitted at the various 2010 inter-sessional meetings.

Besides the scientific documents, there are nine reports of inter-sessional meetings and Species Groups, 26 Annual Reports from the Contracting Parties, and non-Contracting Cooperating Parties, Entities and Fishing Entities, a report from CARICOM, as well as various documents by the Secretariat. The List of SCRS Documents is attached as **Appendix 3**.

**6. Report of Secretariat activities in research and statistics**

The Secretariat presented the "Secretariat Report on Statistics and Coordination of Research 2010" which summarizes activities in 2010. This document was discussed at length during the Species Groups meetings and during the session of the Sub-Committee on Statistics. The first eight tables of this document point out the improvements in data submission and the use of the electronic forms. This report also notes the Secretariat's efforts to implement last year's recommendations from the SCRS concerning the purchase of computer hardware, software and WiFi internet equipment.

The report by the Secretariat also includes summary tables of the information available in the compliance related databases, as requested by the Commission. In 2009 the SCRS requested the Commission's approval of a Data Confidentiality proposal (Appendix 10 Biennal Report 2009). The SCRS again requests the Commission's approval of the Data Confidentiality proposal and reiterates its importance for the purpose of use of detailed information at the Secretariat by the SCRS working groups.

The Executive Secretary informed the SCRS of the incorporation of Dr. Mauricio Ortiz and the permanent position of Mr. Alberto Parilla to the Secretariat staff in 2010. He also noted that Dr. Antonio Di Natale was appointed Coordinator of the Grand Bluefin Year Program (GBYP), and Mr. Takahiro Ara as Coordinator of the ICCAT/Japan Data Management and Improvement Project (JDMIP).

A summary of the activities carried out by the ICCAT/Japan Data Improvement Project (JDIP) was presented (SCI-009) and the meeting was informed of the end of the five-year project. This project continues to support observer programs developed in Tema (Ghana) and Abidjan (Côte d'Ivoire). This program has also made financial contributions towards the holding of training courses in Sao Tome, Ghana, and Vigo (Spain) in collaboration with ICES in 2010.

Likewise, the Secretariat informed of the activities related to the publications carried out in 2010.

**7. Review of national fisheries and research programs**

In accordance with the format established in 2005 and reviewed in 2007, only information relative to new research programs was presented to the Committee. The Committee considered the need to include information of interest for its work, separating it from the Annual Report which, with its current structure, is more geared to providing information to the Commission on compliance. The Committee reiterated the need to follow the guidelines established for the preparation of the Annual Reports and to try to clearly define the contents under the various sections (scientific or compliance).

*Angola*

Les principaux scombridés pêchés en Angola sont: l'albacore (*Thunnus albacares*), le *listao* (*Katsuwonus pelamis*), le thon obèse (*Thunnus obesus*), le germon (*Thunnus alalunga*) et les thonidés mineurs qui sont la thonine commune (*Euthynnus alletteratus*), la bonite à dos rayé (*Sarda sarda*), l'Auxide (*Auxis thazard*). Ces ressources sont exploitées par la flottille artisanale, semi industrielle et industrielle. L'Angola ne dispose pas de bateaux pour la pêche dirigée des thons. Ce sont des embarcations étrangères qui sont en train de pêcher avec leur drapeau dans la Zone économique exclusive dans les eaux angolaises. Ce qui fait que nous ne disposons pas de données pour déclarer à l'ICCAT de grands thonidés. Durant l'année 2009, 54 embarcations étrangères étaient enregistrées pour la capture de grands thonidés. La prise totale pour les thonidés mineurs se situe entre 3.669 tonnes le long de la côte angolaise, représentant 1.979 tonnes pour l'espèce *Sarda sarda*, 1.644 tonnes pour l'espèce *Euthynnus alletteratus* et 46 tonnes pour l'espèce *Auxis thazard*. Ces prises proviennent de la pêche artisanale, semi-industrielle et industrielle locale. Les types d'engins utilisés normalement pour les espèces cibles sont les sennes, chalutage, cannes, ligne à main, principalement madragues et aussi les palangres pour les embarcations étrangères. L'INIP (Institut National de Recherches de Pêches) à travers son Centre de Recherche de Lobito (CIP) est en train de renforcer le programme d'échantillonnage avec la collecte de données biologiques, principalement de fréquence de taille des principales espèces de thonidés mineurs provenant de madragues. Durant l'année 2009, 22 échantillonnages de thons mineurs étaient effectués avec un total de 2.419 poissons qui étaient mesurés. Les données statistiques sont obtenues à partir de DNPA (Direction Nationale de Pêche et Aquaculture), GEPE (Cabinet d'Études de Plans et Statistiques), INIP (Institut National de Recherches de Pêches), CIPs (Centres de Recherches de Pêches) et de IPA (Institut de Pêches Artisanale).

*Brazil*

In 2009, the Brazilian tuna longline fleet consisted of 86 vessels registered in 6 different ports. Of these, 80 were national and 6 were foreign chartered vessels. The number of vessels decreased by about 9.5% from 2008 when 95 vessels operated. The number of chartered vessels, however, decreased by about 33%. The number of bait-boats operating in 2009 was 43, increasing slightly (5%) from 2008. These 43 vessels (100% national) were based in the same ports (Rio de Janeiro-RJ, Itajaí-SC, and Rio Grande-RS). In 2009, the number of purse seiner boats was 8, remaining the same as in the previous year.

The Brazilian catch of tunas and tuna-like fish, including billfish, sharks, and other species, was about 40,000 t (live weight), in 2009, representing an increase of about 12%, from 2008. The majority of the catch again was taken by bait-boats, which accounted for about 60% of the catches, with skipjack tuna being the most abundant species, representing close to 95% of the bait-boat catches. Total catch of the tuna longline fishery was equal to 7,800t, in 2009, being thus about 15% smaller than in 2008, with swordfish being again the most abundant species, with a total catch close to 3.100 t. Blue shark, yellowfin tuna and bigeye tunas were the three most caught species, after the swordfish, accounting for about 16% (1,268 t), 13.5% (1,038 t) and 13% (1,008 t) of the total longline catches. The total catch of white marlin and blue marlin was 52 t and 149 t, respectively, which is similar to the 2008 levels (47 t and 161 t, respectively).

Part of the Brazilian catches continued to result from a small-scale fishing fleet based mainly in Itaipava, on the southeast coast. Although comprised of relatively small boats of about 15 m in total length, this fleet is highly mobile, operating throughout most of the Brazilian coast and targeting a variety of species with different gears, including longline, handline, trolling and other surface gears. The total catch of this fleet, which mainly targets dolphin fish, in 2009, was about 8,000 t, of which 4,372.2 t (53%) was dolphinfish.

Several institutions directly assisted the Ministry of Fisheries and Aquaculture (MPA) in processing and analyzing data from the Brazilian tuna fishery in 2009. Besides the catch and effort data regularly collected in 2009, about 16,000 fish were measured at sea while landings included skipjack= 9,724;

swordfish= 2,109; bigeye= 1,843; yellowfin= 782; blue shark= 596; albacore= 179; sailfish= 111; blue marlin= 102; and white marlin= 42, among others.

In 2009, an important shark and billfish research effort, in cooperation with U.S., Venezuelan and Uruguayan scientists, continued to be developed, including the collection of vertebrae, spines, stomachs and gonads, for age and growth, feeding habits and reproduction studies, as well as habitat utilization, through PSAT tags, and gear selectivity, by the use of circle hooks, hook timers, and TDRs.

Research on the incidental catches of seabirds continued and was aimed mainly at monitoring by-catch and testing mitigation measures, particularly the use of different kinds of torilines. The monitoring of sea turtle by-catches in longline fisheries also continued by the "Projeto Tamar", including tests with the use of circle hooks and other mitigation measures to reduce the catch rates of sea turtles.

In order to adequately comply with ICCAT recommendations, the Brazilian government has implemented several rules regulating the Brazilian tuna fishery, although no new regulation was introduced in 2009. It is important to note, however, that in 2009 Brazil adopted a new law on fisheries and aquaculture and raised the Secretariat of Fisheries and Aquaculture to the level of Ministry.

*Canada*

Bluefin tuna are harvested in Canadian waters from July through December over the Scotian Shelf, in the Gulf of St. Lawrence, in the Bay of Fundy, and off Newfoundland. The adjusted Canadian quota for 2009 was 553.8t. t. A total of 429 licensed fishermen participated in the directed bluefin fishery using rod and reel, handlines, electric harpoon and trap nets to harvest 469 t. Each fish harvested is individually tagged with a unique number and it is mandatory to have every fish weighed out at dockside.

The swordfish fishery in Canadian waters takes place from April to December. Canada's adjusted swordfish quota for 2009 was 1343.2 t with landings reaching 1300 t. The tonnage taken by longline was 1051.8 t while 248 t were taken by harpoon. Only 44 of the 77 licensed swordfish longline fishermen landed fish in the 2009 fishery.

The other tunas (albacore, bigeye and yellowfin) are at the northern edge of their range in Canada throughout the year. Canadian catches of these species have traditionally been a minor portion of the overall Canadian catch of large pelagic species. Porbeagle is the only shark species for which there is a directed longline fishery and the combined directed and by-catch harvests were 62 t in 2009.

All commercial vessels fishing pelagic species are required to hail out their intention to fish prior to a trip and hail in any harvests. The Canadian Atlantic statistical systems provide real time monitoring of catch and effort for all fishing trips on pelagic species. At the completion of each fishing trip, independent and certified Dockside Monitors must be present for off-loading, and log record data must be submitted by each fisherman whether fish are harvested or not.

The Annual Report of Canada contains details of recent scientific initiatives, and interested parties are referred to that document. In addition, a population dynamics specialist has been retained on a full time basis, and this individual will be devoted to ICCAT-related work.

*Cap-Vert*

En 2009 la flotte thonière industrielle et semi industrielle du Cap Vert, a été composée d'environ 70 embarcations opérationnelles. La capture total a été de 10.583 tonnes, pêchés principalement avec le senneur et la ligne / canne dans la pêche industriel ou semi industriel et avec la ligne à main dans la pêche artisanale. C'est remarquable une tendance à la baisse, par rapport à l'année précédent. Il n'y a pas d'activités de pêche ciblée pour les requins mais en raison de la fragilité de notre surveillance, les requins font souvent partie des prises accessoires de la pêche à la palangre de la flotte étrangère qui opère dans notre ZEE. La pêche sportive a été la cible d'une demande raisonnable, mais malheureusement il n'existe pas encore une réglementation claire et détaillée sur cette question. Les istiophoridés sont capturés dans les eaux du Cap-Vert principalement par des navires d'UE et la pêche sportive. La flotte étrangère licenciée, opère dans la ZEE du Cap-Vert, sur la base d'accords ou de contrats de pêche. Les navires appartiennent surtout aux pays de l'Union européenne et les pays asiatiques. L'objectif de la recherche est de faire des recommandations pour l'exploitation optimale et durable des ressources aquatiques vivantes, en vue de la réalisation des objectifs économiques et sociaux établis dans la politique de développement. La recherche halieutique et de l'environnement et les études socio-économiques, sont donc, un instrument de grande importance pour le développement de la pêche. Cap-Vert envoie les informations relatives aux captures, contribuant ainsi à la mise à jour des statistiques et des évaluations des stocks de l'ICCAT.

*China (People's Republic)*

Longline is the only fishing gear used by the Chinese fishing fleet to fish tunas in the Atlantic Ocean. Twenty-six (26) Chinese tuna longliners operated in 2009, with a total catch of 6,357.5 t including tuna, tuna-like species and sharks (in round weight), 938.8 t less than that of 2008 (7,296.3 t). The target species were bigeye tuna and bluefin tuna, of which catches amounted to 4,973 t and 41.7 t in 2009, respectively. Bigeye tuna was the major target species in the Chinese catch, accounting for 78.2% of the total; however, it was 713 t lower than that of 2008 (5,686 t). Yellowfin tuna, swordfish and albacore were taken as by-catch. The catch of yellowfin tuna decreased from 649 t in 2008 to 462 t in 2009. The catch of swordfish was 383 t, with a decrease from the previous year (562 t in 2008). The catch of albacore was 116 t, which represented a 136.7% increase from the previous year.

The data compiled, including Task I and Task II as well as the number of fishing vessels have been routinely reported to the ICCAT Secretariat by the Bureau of Fisheries (BOF), Ministry of Agriculture of the People's Republic of China. The PRC has carried out a national scientific observer program for the tuna fishery in ICCAT waters since 2001. One observer has been dispatched on board one Chinese Atlantic tuna longline fishing vessel covering the area of 6°13'N ~ 14°15'N, 30°51'W~35°36'W since November, 2009. Data of target species and non-target species (sharks, sea turtles, especially) were collected during the observation.

In terms of implementation of the relevant ICCAT conservation and management measures, BOF requires all fishing companies operating in the Atlantic Ocean to report their fisheries data on a monthly basis to the Branch of Distant Water Fisheries of China Fisheries Association and the Tuna Technical Working Group in order to comply with the catch limits. BOF has established a fishing vessel management system, including the issuance of licenses to all the approved Chinese fishing vessels operating on the high seas of world oceans. The Chinese high seas tuna fishing fleet has been required to be equipped with a VMS system since October 1, 2006. BOF has strictly followed the National Observer Program and the ICCAT Regional Observer Program for transshipment at sea.

*Côte d'Ivoire*

Une flottille internationale de grands thoniers fréquente le Port de Pêche d'Abidjan pour des activités de débarquement et/ou de transbordement. Ainsi, en 2009, 52 bateaux (10 français, 26 espagnols, 11 ghanéens et 05 cargos coréens et guinéens) ont débarqué et transbordé 133 796 T de thons majeurs et 23 605 T de faux poissons pour la vente sur le marché local.

Le Centre de Recherches Océanologiques et les structures homologues des pays de pavillons de cette flottille internationale (notamment l'IRD, France et l'IEO, Espagne) ont mis en œuvre un programme de suivi statistique permanent de son activité.

Par ailleurs, une pêcherie artisanale au filet maillant dérivant (environ 200 pirogues), de plus en plus active, a débarqué près de 29 000 T de thons (albacore : 649 t ; listao : 5 330 t ; thonine : 3 170 t ; auxide : 19 684 t) et espèces associées (istiophoridés : 205,7 t ; requins : 72,7 t). Cette pêcherie fait l'objet d'un suivi conjoint du CRO et de la Direction des Productions Halieutiques.

*Croatia*

Total Croatian catch of bluefin tuna in 2009 was 618.6 metric tons (t). Bluefin tuna were predominantly transferred into farming cages (608.96 kg, 98.44%), and 9.65 t (1.56 %) were landed. Catches of bluefin tuna were mostly realized by purse seiners (98.51%), while the remainder was caught using hook and line gears.

The total Croatian catch of Mediterranean (Adriatic) swordfish amounted to 3,119 kg in 2009.

Significant improvements in fleet register and data collection have been made in 2009, enabling Croatia to report more detailed data on bluefin tuna and other tuna-like species. Research was continued on the growth and reproductive biology of bluefin tuna. A national sampling program targeting bluefin tuna harvested from aquaculture facilities has been carried out. Further activities to increase MSC activities (including VMS and electronic logbooks) have been undertaken.

Preliminary results from the 2010 bluefin tuna fishing season and small pelagic fishing are indicating a higher abundance of both juvenile and adult bluefin tuna in the Adriatic Sea than in the previous years.

Croatia has adopted the Regulation on the catch, farming and trade of bluefin tuna that includes provisions of ICCAT Recommendations 06-07, 08-12, 08-05, 09-06 and 09-11 and transposes these into national legislation in full. Croatia implemented the Regional Observers Programme (ROP) on bluefin tuna farms in 2009, in full accordance with the provisions of ICCAT Recommendation 08-05.

Croatia has undergone significant changes in terms of organization of its inspection services.

*European Union*

Les flottilles de l'UE ont capturé durant les années récentes près de 40% des captures totales de l'ICCAT, dont 174.000 tonnes en 2009. Ces prises 2009 sont en hausse sensible comparées aux 160.000 tonnes de 2008, mais elles restent bien inférieures aux prises voisines de 300.000 t, qui étaient observées pour les pays de l'UE au début des années 1990. Huit pays de l'UE pratiquent la pêche des thons dans l'Atlantique et la Méditerranée, par ordre de prises décroissantes en 2009 : l'Espagne (112.000 t), la France (32.000 t), l'Italie (13.600 t), le Portugal (10.700 t), la Grèce (2.700 t), l'Irlande (2.100 t), Malte et Chypre. Les principales espèces capturées par les pays de l'UE en 2009 ont été l'albacore (51.400 t) et le listao (45.400 t), l'espadon et le patudo (20.000t chacune)), le germon (17.500 t), et le thon rouge (11.000 t). On note que si les prises 2009 de thons tropicaux ont été comme en 2008 en hausse sensible, les prises de germon et de thon rouge ont été en 2009 à nouveau en baisse. Tous les engins de pêche classiques sont en activité dans la CE: senneurs, canneurs, palangriers, lignes à main, lignes de traîne, filets maillants, harpons, chalut pélagique, madragues et pêche sportive.

Il faut noter en 2010 l'apport financier déterminant de l'UE dans le lancement du grand programme de recherches sur le thon rouge qui vient d'être initié par l'ICCAT. L'UE finance aussi largement et en routine depuis 2001 la collecte des données biologiques et d'un certain nombre de recherches sur les thonidés de tous ses pays membres. Les données statistiques des taches 1 et 2 qui soumises en 2010 à l'ICCAT par les pays de l'UE sont globalement complètes et conformes aux règles de l'ICCAT. On doit aussi noter que l'UE soutient aussi des programmes observateurs sur diverses flottilles, les senneurs tropicaux avec environ 10% des efforts de pêches suivis par des observateurs, et depuis 2009 100% des jours de pêche observés sur les senneurs pêchant le thon rouge en Méditerranée. Des échantillonnages biologiques des captures de thons tropicaux des senneurs européens continuent aussi d'être menés en routine dans les conserveries d'Abidjan. On note aussi en 2010 un effort de la France pour mieux estimer les activités et les captures de ses pêcheries artisanales sur DCP visant les marlins et les thons en Martinique et Guadeloupe.

On note en outre la participation active des scientifiques européens à toutes les réunions scientifiques de l'ICCAT et le grand nombre de documents SCRS 2010 cosignés par les chercheurs de l'UE dans tous les thèmes des recherches ICCAT. Les pays de la CE réalisent enfin de nombreuses recherches à caractère plus fondamental sur les thons, par exemple sur les écosystèmes, la réduction des prises accessoires, les relations thons environnement, le comportement des thons, les DCP, la reproduction et la production de larves et de juvéniles de thon rouge, etc. La participation des chercheurs des pays de la CE est par exemple active au sein du programme CLIOTOP/GLOBEC qui a de larges objectifs de ses recherches thonières, très pluridisciplinaires et mondiales, et qui visent à réaliser une meilleure modélisation de l'exploitation durable des ressources thonières en fonction de l'environnement et des écosystèmes.

*Ghana*

The tuna industry in Ghana comprises the skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*). 21 baitboats, 11 purse-seiners and 4 Longliners currently fishing within the EEZ of Ghanaian coastal waters and beyond exploit these tuna species amongst other minor tuna-like species such as the black skipjack (*Euthynnus alletaratus*).

During the year under review, skipjack catches were the highest (54.3%) followed by Yellowfin (27.6%) and bigeye (15.8%) respectively. Both fleets employ Fish Aggregating Devices (FADs) in fishing and collaborate extensively sharing their catch during fishing operations. Over 80% of catches are conducted off FADs. Catches for the year 2009 rose slightly to 66470 metric tons (t) from 64093 t in 2008, an increase of approximately 2400 t.

Recent improvements in sampling, coupled with the provision of more logbook information from the fishery, have contributed to a better understanding of the time-area distribution of the species. It is envisaged that further synthesis of the database on Ghana since 1980-2009 would give a clear picture on the catch and species composition of the entire catch in relation to the collaborative fishing strategies and innovations and other factors influencing catchability of the species.

Ghana's Action Plan to strengthen the collection of statistical data and control measures to ensure the implementation of conservation and management measures were presented to the commission.

An observer programme was organized in March-May 2009 on board 4 Purse seine vessels with the aim of training officers on proper methods of estimating catches and filling out of information in logbooks. It was also noticed massive use of FADs throughout the programme. In recommendation among others, it was suggested that due to the massive use of FADs and its attendant effect on juvenile destruction, a precautionary approach should be made to safeguard the industry.

Beach sampling of the Billfishes continued off the Western coastline of Ghana from Artisanal drift gill operators. Revision of Task 3 for the period 1996-2009 have been finalized and standardized CPUE series would be carried out during the year 2011.

*Japan*

Longline is the only tuna-fishing gear deployed by Japan at present in the Atlantic Ocean. The final coverage of logbooks from the Japanese longline fleet has been 90-95% before 2008. The current coverage for 2009 is estimated to be about 90%. In 2009, fishing days amounted to about 25,000 days, which was near the average value in recent ten years. The catch of tunas and tuna-like fishes (excluding sharks) is estimated to be about 30,000 t, which is about 90% of the past ten years' average catch. The most important species was bigeye, representing 55% of the total tuna and tuna-like fish catch in 2009. The next dominant species was yellowfin tuna, which represented 19% in weight, and the third species was bluefin tuna (7%). Observer trips on longline boats in the Atlantic were conducted and a total of about 530 fishing days were monitored. In addition to the logbook submission mentioned above, the Fisheries Agency of Japan (FAJ) has set catch quotas for western and eastern Atlantic bluefin as well as for northern and southern Atlantic swordfish, blue marlin, white marlin and bigeye tuna, and has required all tuna vessels operating in the Atlantic Ocean to submit catch information every day (bluefin tuna) and every ten-day period (for other tunas) by radio or facsimile. All Japanese longline vessels operating in the Convention area have been equipped with satellite tracking devices (VMS) onboard. In accordance with ICCAT recommendations, the FAJ has taken the necessary measures to comply with its minimum size regulations, time area closures, etc. by Ministerial Order. Each species statistical or catch document programs has been conducted. Records of fishing vessels larger than 24 meters in length overall (LSTLVs) have been established. The FAJ has dispatched patrol vessels to the North Atlantic to monitor and inspect Japanese tuna vessels and also to observe the fishing activities of other nations' fishing vessels, and has inspected landings at Japanese ports to enforce the catch quotas and minimum size limits. Prior permission from the FAJ is required in the case that Japanese tuna longline vessels tranship tuna or tuna products to reefers at foreign ports or at sea.

*Korea*

In recent years, the annual catch of tuna and tuna-like species by Korean tuna longliners and purse seiners in ICCAT areas has increased and ranges from 2,438 to 4,668 t, with an average of 3,773 from 2005 to 2009. The major species were bigeye tuna (55.6% of total), yellowfin tuna (16.5%) and bluefin tuna (10.5%) during the recent five years, of which bigeye tuna and yellowfin tuna were the most important species in terms of catch size and high commercial value in sashimi markets. In 2009, 24 Korean longliners and one purse seiner operated in the ICCAT area and caught a total of 3,856 t, which was a decrease as compared to the catch of the previous year. Almost 78% of the total catch was comprised of the three major species, of which the bigeye tuna catch was 2,134 t (55% of total), albacore 458 t (12%) and yelowfin tuna 433 t (11%). It was apparent that the yellowfin tuna catch sharply decreased from 993 t in 2008 to 433 t in 2009, while albacore catch increased from 147 t in 2008 to 458 t in 2009. Korean longliners operated mainly in the tropical area of the Atlantic Ocean and targeted bigeye tuna and yellowfin tuna. The fishing season was throughout the year, from January to December in 2009, in the central Atlantic Ocean (15°N~5°S, 0°W~40°W). One Korean purse seiner based in Malta fished bluefin tuna in the Maltese area (34°~35°N, 13~15°E) of the Mediterranean Sea for one month. During the 2009 fishing season, a total of 102 t of bluefin tuna was caught in a joint fishing operation (Korea and France). The Korean catch of bluefin tuna accounted for 77% of the Korean quota (132.26 t) for 2009. The CPUE (t/set) of the bluefin tuna catch by joint fishing fleets was 42 t/set.

*Maroc*

La pêche des espèces de thonidés et des espèces apparentées a atteint une production de 13,956 tonnes au cours de l'année 2009 soit, le même niveau de captures générales qu'en 2008.

Les principales espèces exploitées le long des côtes marocaines sont le thon rouge, l'espadon, le thon obèse, l'albacore, le germon, les thonidés mineurs et des espèces de squales.

La collecte de données statistiques de pêche et d'effort, se fait pratiquement d'une manière exhaustive, à travers les structures administratives des pêches (Département des Pêches et l'Office National des Pêches), implantées tout au long des côtes atlantique et méditerranéenne du Maroc. Un contrôle se fait également en aval par l'Office des Changes, en ce qui concerne les exportations des produits de la pêche.

Sur le plan scientifique, l'Institut National de Recherche Halieutique -INRH-, à travers ses Centres Régionaux (au nombre de cinq), couvrant tout le littoral marocain, a renforce la collecte de données biologiques des principales espèces (thon rouge et espadon). Le Centre Régional de l'INRH à Tanger sert de coordinateur de collecte de toutes ces données. Au cours de ces dernières années, d'autres espèces ont commencé à être suivies, notamment celles des thonidés tropicaux (thon obèse entre autres), avec une extension des travaux de recherche vers les zones situées au Sud du Maroc.

Un grand progrès a été ainsi enregistré en matière de collecte de données biologiques, tel qu'en témoignent la série de documents scientifiques, ainsi que des bases de données de la Tâche 2, soumis par les chercheurs marocains aux différentes sessions SCRS, à des fins d'évaluation de stocks de thonidés.

*México*

La pesca de altura con palangre se dirige al atún aleta amarilla o rabil (*Thunnus albacares*), en la que incidentalmente se capturan otros grupos de especies, concentrándose en aguas oceánicas y limitándose a la Zona Económica Exclusiva (ZEE) en el Golfo de México y Mar Caribe. De las 37 embarcaciones mayores con permiso de pesca, actualmente operan 29 con capacidad de acarreo. De los seis estados costeros del Golfo de México y Mar Caribe, Veracruz y Yucatán contribuyen con 85% de la captura total. La mayor captura del atún aleta amarilla se ha obtenido en los meses de verano. El producto principalmente es exportado a Estados Unidos en calidad de fresco. La captura del aleta amarilla registró un máximo histórico de 1,390 t en el año 2000, mientras que en 2003 se registró un decremento gradual de 1,362 t a 890 t en 2007, seguido de un ligero incremento de 956 t en 2008 y 1,210 t en 2009. En relación al esfuerzo pesquero, se observa un marcado decremento en el esfuerzo de pesca en 2009. En 2009, se registró una captura total (captura embodegada, liberada viva y descartada muerta) de 1,723 t, integrada tanto por el atún aleta amarilla (73%), como por la captura incidental (27%).

Durante 2009, los esfuerzos de México estuvieron dirigidos a la mejora de calidad y cantidad de información científica, a través de su validación, edición y concatenación. De manera complementaria se ha llevado a cabo la capacitación y actualización de observadores a bordo en el Golfo de México. Todo ello, para dar cumplimiento oportuno tanto a compromisos nacionales, como internacionales en el marco de ordenación de la pesquería con palangre. Adicionalmente, se ha privilegiado la divulgación científica de estos logros, a través de reuniones técnicas, foros, intercambios educativos, que han involucrado tanto la participación del sector industrial, sector gubernamental y sector educativo.

*Norway*

In light of the critical stock situation for Atlantic bluefin tuna, Norway has adopted a prohibition for Norwegian vessels to fish and land bluefin tuna in Norway's territorial waters, in the Norwegian Economic Zone and in international waters. It is also prohibited to import and export Atlantic bluefin tuna, bigeye tuna and Atlantic swordfish in Norway without valid catch documentation.

No catches of Atlantic bluefin tuna were reported by Norway in 2009. Only one visual sighting of a juvenile bluefin tuna was reported in western Norway in June 2009.

Norway continuously works on historical data, and aims to put the data on this species into an ecosystem perspective. Extensive data and preliminary results on catch per unit effort (CPUE) from the Norwegian bluefin tuna fleet for the period 1950-1980 was made available for SCRS in 2009.

Norway participated in all major international scientific meetings concerning Atlantic bluefin tuna in 2009.

*Russia*

*The Fishery.* In 2009 a specialized purse-seine tuna fishery was carried out periodically in the Equatorial area by two purse seiners in an experimental mode of operation. The total catch amounted to 336 t (33 t of yellowfin tuna, 43 t of bigeye tuna and 260 t of oceanic skipjack).
The trawl fishery vessels caught 161 t of tunas and 366 t of bonito as by-catch from the Central-East Atlantic Ocean during 2009. In the first half of 2010, the trawl fishery vessels caught 168 t of tunas and 426 t of bonito.

*Scientific research and statistics.* In 2009 and the first half of 2010, the observers collected material onboard trawlers. The tuna species, size composition and proportions of all fish species in the total catches were estimated.

A comparative morphologic analysis of the teeth and body parameters of blue shark from the Atlantic and eastern Pacific Oceans was carried out.

The comparison indicates that the teeth morphology of Atlantic and Pacific sharks is similar. Sharks from different oceans differed in body proportions. Sexual dimorphism was found in blue sharks.

*Implementation of ICCAT conservation and management measures.* During the fishery in the areas where tunas and tuna-like species occur in catches, the ICCAT requirements and recommendations concerning restrictions on the tuna fishery, and a ban imposed on fishing species under quotas were observed.

*Senegal*

Au Sénégal, les espèces de thonidés et espèces apparentées sont essentiellement exploitées par la pêche industrielle composée de canneurs ciblant les thons majeurs albacore (*Thunnus albacares*), patudo (*Thunnus obesus*) et listao (*Katsuwonus pelamis*) et de palangriers recherchant l'espadon (*Xiphias gladius*). Par ailleurs, une partie des pêcheries artisanales exploite à la ligne à la main, à la ligne traine et à la senne tournante les petits thonidés : thonine (*Euthynnus alletteratus*) ; maquereau bonite (*Scomberomus tritor*) ; palomette (*Orcynopsis unicolor*) et bonite à dos rayé (*Sarda sarda*) ; thazard bâtard (*Acanthocybium solandri*) ; auxide (*Auxis thazard*). Les poissons porte épée (espadon (*Xiphias gladius*) ; marlin (*Makaira nigricans*) et voilier (*Istiophorus platypterus*) sont aussi capturés. La pêche sportive cible les istiophoridés (marlins et voilier) durant la saison de pêche située de mai à décembre.

En 2009, les 7 thoniers canneurs sénégalais ont débarqués 6720 tonnes dont 1157 tonnes d'albacore, 4513 tonnes de listao, 1041 tonnes de patudo, 6 tonnes de thonine et 4 tonnes d'auxide. La pêche palangrière qui est composée de 04 navires a débarqué 590 tonnes. Les captures sont constituées de 195 tonnes d'espadon, 327 tonnes de requins, 11 tonnes d'albacore, 24 tonnes de marlin, 2 tonnes de voilier et 27 tonnes d'ailerons.

Quant aux pêcheries artisanales, les débarquements de toutes espèces confondues ont été estimés à 5315 tonnes en 2009. Les captures de la pêche sportive s'élevaient à 78 tonnes de voiliers et 37 tonnes de marlins pour un effort de 638 sorties.

Sur le plan scientifique, la collecte de données statistiques des thonidés débarqués par les navires nationaux et étrangers (surtout français et espagnols) ayant Dakar comme port d'attache, se fait régulièrement par l'équipe du Centre de Recherches Océanographiques de Dakar/Thiaroye (CRODT). Les informations obtenues sont complétées par les captures effectives de diverses sources (armements, Direction des pêches maritimes, etc.).

L'échantillonnage est réalisé lors des débarquements des navires nationaux et étrangers au port de Dakar par une équipe de trois enquêteurs. En 2009, 226 échantillons de tailles plurispécifiques sont effectués sur les canneurs sénégalais. L'échantillonnage des istiophoridés (surtout le voilier-*Istiophorus platypterus)* est réalisé aussi dans les principaux centres de débarquement de la pêche artisanale notamment à Soumbédioune, Yoff et Mbour.

Les mesures de conservation et de gestion de l'ICCAT ont été bien suivies par le Sénégal. Le système de suivi de contrôle et de surveillance de toutes les activités de pêche mis en place au port permet d'effectuer des inspections ainsi que d'identifier tout navire menant des activités de pêche illicite.

*Turkey*

During the course of 2009, the total catch of tuna and tuna-like fishes amounted to 8,633 t. In 2009, Turkey's total catches of bluefin tuna, albacore, Atlantic bonito and swordfish were 665,4 t, 631 t, 7,036 t, and 301 t, respectively. All bluefin catch was caught by purse seiners, the majority of which have an overall length of 30-50 m and a GRT of 200-300. The fishing operation was conducted intensively off Antalya Bay and in the region between Antalya Gazi Paşa and Cyprus. In the Mediterranean, fisheries were conducted in the region between Cyprus-Turkey and in the Cyprus-Syria region. The highest bluefin tuna catch was obtained in June. Recommendations and resolutions imposed by ICCAT were transposed into national legislation and implemented. All the conservation and management measures regarding bluefin tuna fisheries and farming are regulated by national legislation through notifications, considering ICCAT's related regulations. The Fisheries Information System has been updated in order to meet the requirements of data exchange at the national and regional level. Major research activities in 2009 focused on albacore.

*United States*

The total (preliminary) reported U.S. catch of tuna and swordfish, including dead discards, in 2009 was 9,605 metric tons (t), an increase of about 16% from 8,304 t in 2008. Estimated swordfish catch (including estimated dead discards) increased from 2,530 t in 2008 to 2,838 t in 2009, and provisional landings from the U.S. fishery for yellowfin slightly increased in 2009 to 2,802 t from 2,407 t in 2008. In 2009, U.S. vessels fishing in the northwest Atlantic caught an estimated 1,228 t of bluefin, an increase of 307 t compared to 2008. Provisional skipjack landings increased by 52 t to 119 t from 2008 to 2009, estimated bigeye landings slightly increased by about 28 t compared to 2008 to an estimated 516 t in 2009, and estimated albacore landings decreased from 2008 to 2009 by 60 t to 188 t.

In 2009, the United States continued research to enhance the knowledge of tuna and tuna-like species in areas such as age and growth, stock structure, biological characteristics, migration patterns, habitat utilization, etc. As in previous years, the United States maintained its scientific observer coverage of the pelagic and bottom longline fleets and the gillnet fisheries. A description of time-area closures and the impact of such management measures to reduce the dead discards in the swordfish pelagic longline fisheries are also provided.

*Uruguay*

Durante el año 2009, operaron 9 barcos con palangre de superficie y 5 de palangre profundo, estos últimos en un proyecto de prospección de Patudo en conjunto con una empresa japonesa. La captura total (preliminar) desembarcada y comunicada en 2009 fue de aproximadamente 2525 toneladas.

*Investigación y estadísticas*

Durante el año 2009 se realizaron diversas actividades vinculadas a las estadísticas, investigación y ordenación. Algunas de estas actividades se desarrollaron conjuntamente con otras instituciones nacionales e internacionales. En 2009 se iniciaron investigaciones independientes de la pesquería a bordo del buque de investigación científica de la DINARA con el objetivo general de recabar información más detallada sobre las especies del ambiente pelágico oceánico, experimentos de medidas mitigatorias etc.

*Investigación*

La investigación se desarrolló principalmente a partir de la información proveniente de los partes de pesca y del Programa de Observadores (PNOFA) y durante 2009 se integraron los datos obtenidos en el Buque de Investigación. El PNOFA cubrió una importante parte de la actividad de la flota de bandera nacional y el 100% en la flota de palangre profundo que participo en la investigación de prospección del Paludo. Durante 2009 se observaron aproximadamente 1.600.000 anzuelos. En el 2009 se continuó con el programa de marcado, colocando 473 marcas proporcionadas por la CICAA (5 recuperadas) así como con las actividades de extensión y divulgación.

Se colaboró en diferentes reuniones intersesionales (SWO, POR) presentando trabajos para las evaluaciones y reuniones preparatorias. Se vienen desarrollando estudios genéticos para la identificación de especies y estudios de edad y crecimiento en *Tetrapturus pfluegeri*, en conjunto con otros países. Se trabajó en la preparación de las cartillas de identificación de tiburones de la CICAA y se actualizo la información sobre tiburones (Capitulo 2, Sección 2.2.1) del nuevo Manual de la CICAA. Se ha desarrollado investigación dirigida al seguimiento y evaluación de la problemática de la captura incidental de aves marinas así como a la implementación de medidas de mitigación para su implementación en la flota.

También se están desarrollando estudios de alimentación, migración, uso de hábitat, genéticos, entre otros, en las tortugas marinas. Se siguen desarrollando experimentos con anzuelos circulares, tanto en la flota que utiliza palangre de tipo americano como en el buque de investigación de la DINARA. Se continuó con la investigación de los mamíferos marinos que interactúan con la flota. Durante 2009 se realizó un proyecto de prospección para determinar la posibilidad de pesca de atún patudo *(T. obesus)* en aguas uruguayas. Para esto, cinco barcos japoneses de aproximadamente 50 m de eslora operaron entre marzo y setiembre dentro de las 200 millas de Uruguay, principalmente sobre el talud continental. Durante esta prospección se realizaron 501 lances, los cuales fueron cubiertos en un 100% por observadores uruguayos. También en estos barcos se continuó con el testeo de medidas de mitigación, utilizando las líneas espantapájaros diseñadas por Uruguay.

*Implementación de las medidas de conservación y ordenación de ICCAT*

Se continúa con la implementación del "Plan de Acción Nacional para Reducir la Captura Incidental de Aves Marinas en las Pesquerías Uruguayas" y el "Plan de Acción Nacional para la Conservación de los Condrictios en las pesquerías uruguayas".

Entre las normas nacionales sobre ordenación continúan vigentes las referidas a tallas mínimas de captura para pez espada (25 kg, 15% tolerancia), patudo y rabil (3,2 kg).

*Venezuela*

La flota venezolana orientada a los recursos pelágicos estuvo conformada en 2009 por 60 unidades industriales: 46 palangreros, 6 cerqueros y 8 cañeros; y se registran además 35 embarcaciones artesanales que operan con redes de enmalle y 48 con palangre superficial. Ese año se produjeron desembarques de túnidos y afines provenientes del océano Atlántico por 7.103 t. El 91,6% de estos lo representan los atunes, entre los cuales el más importante fue el aleta amarilla (*T. albacares*) con 45 %, mientras que el bonito listado (*K. pelamis*) y el aleta negra (*T. atlanticus*) y albacora (*T. obesus*) alcanzaron 32 %, 4 % y 6 %, respectivamente. La captura incidental estuvo conformada por marlines, entre los que se destacan el pez vela (*Istiophorus albicans*) con 2,2 % y la aguja azul (*Makaira nigricans*) con 1,5 %, y tiburones cuyos desembarques representan el 2,3 %. El 52 % de los desembarques provinieron de la pesquería de cerco, 19 % de la de caña, 24 % de palangre y 5 % de las pesquerías artesanales. En 2009 continuaron las investigaciones sobre la pesquería de los grandes pelágicos; éstos incluyen los atunes, marlines y tiburones; y se mantuvo el programa de observadores científicos a bordo de embarcaciones industriales de palangre y la cobertura de los torneos de pesca deportiva.

– *Cooperating Parties, Entities or Fishing Entities*

*Chinese Taipei*

In 2009, the total number of authorized longline vessels in the Atlantic Ocean was 109, which included 60 longliners authorized to target bigeye tuna and 49 to target albacore. The catch of the longline fleet declined from 45,437 metric tons (t) in 1998 to 28,090 t in 2009, and the catches of bigeye tuna, yellowfin tuna and albacore were 13,252 t, 1,391 t and 9,541 t, respectively. Bigeye and yellowfin tuna catches increased from those of 2008, which was mainly due to the increase in fishing effort from the low fishing effort level because of the high fuel price in 2008. However, albacore catches decreased for some longliners that were temporarily out of operation. There were 25 observers placed on fishing vessels in the Atlantic Ocean, and the observer coverage rate was above the requirement set by ICCAT. The research projects conducted by scientists in 2009 included CPUE standardizations for North and South Atlantic albacore, swordfish and bigeye tuna, and distribution of ecologically related species in the Atlantic Ocean. Scientific documents on these research projects were submitted to various inter-sessional scientific meetings organized by ICCAT.

**8. Executive Summaries on species**

The Committee reiterates that, in order to obtain a more rigorous scientific understanding of these Executive Summaries, readers consult previous Executive Summaries as well as the corresponding Detailed Reports, which are published in the Collective Volume series.

The Committee also notes that the texts and tables in these summaries generally reflect the information that was available to ICCAT immediately before the plenary sessions of the SCRS, as they were drafted by the Species Group meetings. Therefore, catches reported to ICCAT during or after the SCRS meeting may not be included in the Summaries.

Original: English

*8.1 YFT – YELLOWFIN TUNA*

A stock assessment for yellowfin tuna was conducted in 2008, at which time catch and effort data through 2006 were available. The catch table presented in this Executive Summary (**YFT-Table 1**) has been updated to include catches through 2009. Readers interested in a more complete summary of the state of knowledge on yellowfin tuna should consult the detailed report of the 2008 ICCAT Joint Stock Assessment of Atlantic Skipjack and Yellowfin Tuna (SCRS/2008/016).

Other information relevant to yellowfin tuna is presented elsewhere in this SCRS Report:

- The Tropical Tunas Work Plan (**Appendix 5**) includes plans to address research and assessment needs for yellowfin tuna.

*YFT-1. Biology*

Yellowfin tuna is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three oceans. The sizes exploited range from 30 cm to 170 cm FL; maturity occurs at about 100 cm FL. Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye, and are mainly limited to surface waters, while larger fish form schools in surface and sub-surface waters. The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning primarily occurring from January to April. Juveniles are generally found in coastal waters off Africa. In addition, spawning occurs in the Gulf of Mexico, in the southeastern Caribbean Sea, and off Cape Verde, although the relative importance of these spawning grounds is unknown. Although such separate spawning areas might imply separate stocks or substantial heterogeneity in the distribution of yellowfin tuna, a single stock for the entire Atlantic is assumed as a working hypothesis, taking into account the transatlantic migration (from west to east) indicated by tagging, a 40-year time series of longline catch data that indicates yellowfin are distributed continuously throughout the entire tropical Atlantic Ocean, and other information (e.g., time-area size frequency distributions and locations of fishing grounds). Movement rates, routes, and local residence times remain highly uncertain, however. Males are predominant in the catches of larger sized fish, which may indicate that there are important differences between sexes with respect to growth and/or natural mortality. Natural mortality is assumed to be higher for juveniles than for adults; this is supported by tagging studies for Pacific yellowfin. Uncertainties remain as to the scale of these natural mortality rates, however, with important implications for stock assessment.

Growth rates have been described as relatively slow initially, increasing at the time the fish leave the nursery grounds, and is supported by results from tagging data in other oceans. Nevertheless, questions remain concerning the most appropriate growth model for Atlantic yellowfin tuna. A recent study (Shuford *et al.* 2007) developed a new growth curve using daily growth increment counts from otoliths. The results of this study, as well as other recent hard part analyses, do not support the concept of the two-stanza growth model (initial slow growth) which is currently used for ICCAT (as well as other management bodies) yellowfin tuna stock assessments and was developed from length frequency and tagging data. This discrepancy in growth models could have implications for stock assessments; however, recent analyses indicate that assuming this alternative growth model would result in only moderate changes to estimates of stock status using current age-structured assessment models and assumptions of natural mortality vectors.

The younger age classes of yellowfin tuna exhibit a strong association with FADs (fish aggregating devices/floating objects, which can be natural or artificial). The Committee noted that this association with FADs, which increases the vulnerability of these smaller fish to surface fishing gears, may also have a negative impact on the biology and on the ecology of yellowfin due to changes in feeding and migratory behaviors.

*YFT-2. Fishery indicators*

In contrast to the increasing catches of yellowfin tuna in other oceans worldwide, there has been a reduction in overall Atlantic catches, with an overall decline of 39% from the peak catches of 1990, although catches have increased by 10% (to a provisional 118,871 t) relative to 2006, the last year of data available for the assessment). Recent trends have differed between the western and eastern Atlantic, with the overall catches in the west declining by 26% since 2006. In the eastern Atlantic, on the other hand, catches increased by 23% since 2006, mainly due to substantial increases in purse seine effort.

In the eastern Atlantic, where overall catches peaked in 1990, purse seine catches declined from 128,729 t in 1990 to less than half that (58,319 t) in 2006, but then increased by nearly a third from that level to 76392 t in 2009 (**YFT-Table 1; YFT-Figure 2**). Baitboat catches declined by half from 1990 to 2006(from 19,648 t to 10,434 t), but have increased by 5% to 10,949 in 2009. Longline catches, which were 10,253 t in 1990, have fluctuated since between 5,790 t and 14,638 t and were 7,180 t in 2006 (a 30% decrease from 1990), increasing again by 8% between 2006 and 2009 to 7808 t. In the western Atlantic where overall catches peaked in 1994, purse seine catches declined by three-quarters from 1994 to 2006(from 19,612 t to 4,442 t), and by 2009 had decreased by another two-thirds relative to 2006 (1,365 t). Baitboat catches declined by nearly two-thirds between 1994 and 2006, from 7,094 t to 2,695 t, and in 2009 were reduced by half again from the 2006 level (to 1331 t). Longline catches, which were 11,343 t in 1994, have fluctuated since between 10,059 t and 16,019 t, were 14,288 t in 2006 (a 26% increase from 1990) and remained about the same by 2009 (14,992 t). It was noted that Brazilian catches declined in 2008-2009 as a result of reductions in effort and targeting; this may also be the case for Venezuela in 2007-2009. However, United States catches during 2008-2009 declined substantially despite maintaining similar effort levels to previous years. The most recent available catch distribution is given in **YFT-Figure 1**. However, it should be noted that official reports are not yet available from several Contracting and/or non-Contracting Parties, and some of these figures are based upon data provided by CPC scientists and/or derived from recent catch levels.

The nominal effort in the purse seine fishery had been declining through 2006. As an indicator, the number of purse seiners from the European and associated fleet operating in the Atlantic had declined from 44 vessels in 2001 to 25 vessels in 2006 (the last year of data included during the assessment), with an average age of about 25 years (see **SKJ-Figure 3** for trends in number of vessels and carrying capacity). Since then, however, the number of purse seiners has increased by 50% to 37, as vessels have moved from the Indian Ocean to the Atlantic. At the same time, the efficiencies of these fleets have been increasing, particularly as the vessels which had been operating in the Indian Ocean tend to be newer and with greater fishing power and carrying capacities. On the other hand, since 2006 the European and associated baitboat fleet, based in Dakar, varied in number only slightly.

Several scientific documents were presented which were descriptive of the catches by country fleets. Catch rate trends for a number of fisheries were considered during the assessment. Examination of nominal catch rate trends from purse seine data suggest that catch-per-unit effort was stable or increasing in the East Atlantic (the catch rate trends of individual country fleets differ somewhat), and was clearly declining in the West Atlantic (**YFT-Figure 3**). If effort efficiency is estimated to have continued to increase as has been assumed in the past, adjustments for such efficiency change would be expected to result in a steeper declining trend. However, the decrease in western Atlantic purse seine catch rates could be linked to specific environmental conditions (e.g. high surface temperatures, reduced availability of prey, etc.), especially considering that decreases are also seen in skipjack catch rates, and it is therefore difficult to conclude that these rates reflect abundance trends. Baitboat catch rate trends (**YFT-Figure 4**) exhibit large fluctuations, with a somewhat declining overall trend. Such large fluctuations reflect changes in local availability, which (although of great import to the respective fisheries) do not necessarily reflect stock abundance trends (*i.e.* localized environmental changes as well as changes in migratory patterns may produce such results). Standardized catch rates for the longline fisheries (**YFT-Figure 5**) generally show a declining trend until the mid-1990s, and have fluctuated without clear trend since.

The average weight trends by fleet (1970-2006) are shown in **YFT-Figure 6**. The recent average weight in European purse seine catches, which represent the majority of the landings, has declined to less than half of the average weight of 1990. This decline is at least in part due to changes in selectivity associated with fishing on floating objects, although there have been recent indications that the mean weight of large fish caught in free schools has been declining. A declining trend is also reflected in the average weight of eastern tropical baitboat catches. Longline mean weights have also followed a generally declining trend, although estimates have been highly variable in recent years.

Apparent changes in selectivity can also be seen in the overall trends in catch at age shown in **YFT-Figure 7**. The variability in overall catch at age is primarily due to variability in catches of ages 0 and 1 (note that the catches in numbers of ages 0 and especially 1 were particularly high during the period 1999-2001). These ages are generally taken by the surface fisheries around FADs.

*YFT-3. State of the stock*

A full stock assessment was conducted for yellowfin tuna in 2008, applying both an age-structured model and a non-equilibrium production model to the available catch data through 2006.

An age-structured virtual population analysis (VPA) was conducted using fifteen indices of abundance. The VPA, using results from the base case runs, estimates that the levels of fishing mortality and spawning biomass in recent years have been very close to MSY levels. The estimate of MSY derived from these analyses was 130,600 t. This estimate may be below what was achieved in past decades because overall selectivity has shifted to smaller fish (**YFT-Figure 7**); the impact of this change in selectivity on estimates of MSY is clearly seen in the results from VPA (**YFT-Figure 8**). The estimate of relative fishing mortality ($F_{2006}/F_{MSY}$) was 0.84, and for relative biomass ($B_{2006}/B_{MSY}$) was 1.09.

The stock was also assessed with a production model (ASPIC). Analyses were conducted using either nine separate indices or using a combined index created from all available abundance indices by fleet and gear, and weighting each index by the area covered by that fishery. The estimate of MSY derived using the basic case runs of ASPIC was 146,600 t. Although the estimate of MSY was somewhat higher than that from the age structured model, the stock status results are slightly more pessimistic. The estimate of relative fishing mortality ($F_{2006}/F_{MSY}$) was 0.89, and for relative biomass ($B_{2006}/B_{MSY}$) was 0.83.

Trajectories of $B/B_{MSY}$ and $F/F_{MSY}$ from both age structured (VPA) and the production model (ASPIC) analyses are shown in **YFT-Figure 9**. When considering the results of each model, it should be noted that each has relative strengths and weaknesses; the production model utilizes all the years of available data but assumes that selectivity across lengths (ages) doesn't change over time, whereas the age structure model can track changes in selectivity but relies on accurate assignment of ages and is restricted to years for which adequate catch at size data are available. The trend estimated from VPA indicates that overfishing ($F>F_{MSY}$) has occurred in recent years, but that the current status is neither overfished ($B<B_{MSY}$) nor is there over fishing. The more pessimistic ASPIC estimates indicate that there has been both overfishing and an overfished status in recent years, but that overfishing was not occurring in 2006. Bootstrapped estimates of the current status of yellowfin tuna based on each model, which reflect the variability of the point estimates given assumptions about uncertainty in the inputs, are shown in **YFT-Figure 10**. Examination of the distribution of these estimates from both models shows that about 40% indicate a sustainable situation, in which the stock is not overfished and overfishing is not occurring (**YFT-Figure 11**).

In summary, 2006 catches are estimated to be well below MSY levels, stock biomass is estimated to be near the Convention Objective and recent fishing mortality rates somewhat below $F_{MSY}$. The recent trends through 2006 indicate declining effective effort and some recovery of stock levels. However, when the uncertainty around the point estimates from both models is taken into account, there was still about a 60% chance that stock status was not consistent with Convention objectives.

*YFT-4. Outlook*

Projections were made considering a number of constant catch scenarios (see **YFT-Figure 12** for the results from the age-structured model). These indicate that catches of 130,000 t or less are sustainable during the projection interval, while catches in excess of 130,000 t can lead to overfishing. Maintaining current catch levels (110,000 t) is expected to lead to a biomass somewhat above $B_{MSY}$.

In terms of equilibrium conditions, the various assessment model results show that increasing fishing mortality in the long term by up to 10% (depending on the model) to reach $F_{MSY}$ would only result in equilibrium yield gains of 1% to 4% (**YFT-Figure 13**) over the expected yields at current fishing mortality levels.

It is noted that catch levels until 2007 had been held in check, despite increasing efficiencies of individual vessels, by a continued decline in the number of purse seine vessels in the eastern Atlantic. This trend has since reversed, and given a continuation of the recent movement of additional, newer vessels from the Indian Ocean into the Atlantic, with a corresponding increase in fishing mortality, the situation should be monitored closely to avoid adverse impacts on stock status.

Yearly catches of small (less than 3.2 kg) yellowfin tuna in numbers have ranged around 60-75% of purse seine catches and about 40-80% of baitboat catches since 2000, occurring primarily in the equatorial fisheries. The generally declining trends in average weight may still be a cause for concern. Minimum size limits for yellowfin tuna have been shown to be ineffective by themselves, due to difficulties related to the multi-species nature of the fishery. Yield-per-recruit analyses, the results of which are strongly dependent upon the natural mortality vector assumed, have indicated that reductions in fishing mortality on fish less than 3.2 kg could result in gains in yield-per-recruit and modest gains in spawning biomass-per-recruit. The protection of juvenile tunas may therefore be important and alternative approaches to minimum size regulations to accomplish this should be studied. Evaluations have been conducted on the relative impact of effective effort restrictions on individual fisheries in terms of yield per recruit and spawning biomass per recruit and are presented in the Report of the 2009 Inter-sessional Meeting of the Tropical Tuna Species Group (SCRS/2009/011). This year, a scientific document (SCRS/2010/152) has been presented describing initiatives to develop and test bycatch (including juvenile tuna) mitigation options for tropical purse seine fisheries, with investigations to be conducted in all oceans.

*YFT-5. Effects of current regulations*

Recommendation 04-01 implemented a small closure for the surface fishing in the area 0°-5°N, 10°W-20°W during November in the Gulf of Guinea. Although this regulation is intended to reduce small bigeye catches, the Committee recognizes that its implementation and the change from the previous moratorium to the current regulation will potentially impact yellowfin catches. Given the relatively small time-area coverage of the closure, any reduction in juvenile mortality is expected to be minimal. This expectation is supported by analyses of purse seine catches which were presented to the Committee, confirming that the new closure has been less effective than previous moratoria in reducing the proportional catch of small fish harvest and avoiding growth overfishing, at least with respect to the catches of European and associated fleets. If management objectives include reductions in juvenile mortality, there is a general agreement that larger time/area moratoria are likely to be more precautionary than a smaller moratoria, providing that the moratoria are fully complied with. As requested by the Commission, in 2009 the Committee analysed the closure contained in [Rec. 08-01] and alternative closures. The response to the Commission's request is provided in a separate section of the 2009 SCRS report.

In 1993, the Commission recommended "that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992". As measured by fishing mortality estimates from VPA, during the 2008 assessment, effective effort in 2006 appeared to be well below (about 25-30% below) the 1992 levels, and there has been a declining trend in recent years.

*YFT-6. Management Recommendations*

The status of yellowfin showed some improvement between the 2003 and 2008 assessments, which is not surprising in that catches and fishing effort generally declined and there were small increases in catch rates observed for some longline fisheries over the past few years. Stock biomass in 2006 was estimated to be near the Convention Objective and fishing mortality rates somewhat below $F_{MSY}$. Continuation of current catch levels is expected to lead to a healthy biomass, somewhat above $B_{MSY}$, which should provide adequate safeguard against biomass falling below the Convention objective as long as fishing effort does not substantially increase. Effort increases on the order of about 10% above current levels (in order to achieve MSY) would be expected in the long run to increase yield by only about 1-4% over what could be achieved at current effective effort levels, but with substantially increased risk of biomass falling below the Convention objective. In addition, the Commission should be aware that increased harvest of yellowfin could have negative consequences for bigeye tuna in particular, and other species caught together with yellowfin in fishing operations taking more than one species. The Committee also continues to recommend that effective measures be found to reduce fishing mortality of small yellowfin, if the Commission wishes to increase long-term sustainable yield.

## ATLANTIC YELLOWFIN TUNA SUMMARY

| | |
|---|---|
| Maximum Sustainable Yield (MSY) | ~130,600 t [1] (124,100-136,500)<br>~146,600 t [2] (128,200-152,500) |
| 2006 Yield [3] | 108,160 t |
| Current Yield[3] (2009) | 118,871 t |
| Replacement Yield (2006) | ~ 130,000 t |
| Relative Biomass $B_{2006}/B_{MSY}$ [4] | 0.96 (0.72-1.22) |
| Relative Fishing Mortality: $F_{current(2006)}/F_{MSY}$ [4] | 0.86 (0.71-1.05) |
| $F_{current(2006)}/F_{0.1}$ [5] | 1.26 (1.11-1.44) |
| $F_{current(2006)}/F_{20\%SPR}$ [5] | 0.81 (0.73-0.93) |
| $F_{current(2006)}/F_{30\%SPR}$ [5] | 1.12 (1.01-1.29) |
| $F_{current(2006)}/F_{40\%SPR}$ [5] | 1.52 (1.35-1.73) |

Management measures in effect:

- Effective fishing effort not to exceed 1992 level [Rec. 93-04].

NOTE: $F_{current(2006)}$ refers to $F_{2006}$ in the case of ASPIC, and the geometric mean of F across 2003-2006 in the case of VPA. As a result of the constant trend in recruitment estimated by the VPA model, $F_{MAX}$ is used as a proxy for $F_{MSY}$ for VPA results.

[1] Estimates (with 80% confidence limits) based upon results of the age-structured model (VPA).
[2] Estimates (with 80% confidence limits) based upon results of the non-equilibrium production model (ASPIC).
[3] The assessment was conducted using the available catch data through 2006. Subsequent revisions have reduced reported catch levels slightly to 107,859 t.
[4] Median (25th-75th percentiles) from joint distribution of age-structured and production model bootstrap outcomes considered.
[5] Result exclusively from VPA and yield-per-recruit analyses.

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Original: English

*8.2 BET- BIGEYE TUNA*

The last stock assessment for bigeye tuna was conducted in 2010 through a process that included a data preparatory meeting in April and an assessment meeting in July. The last year covered of catch data was 2009 but most indices of relative abundance stopped in 2008.

*BET-1. Biology*

Bigeye tuna are distributed throughout the Atlantic Ocean between 50°N and 45°S, but not in the Mediterranean Sea. This species swims at deeper depths than other tropical tuna species and exhibits extensive vertical movements. Similar to the results obtained in other oceans, pop-up tagging and sonic tracking studies conducted on adult fish in the Atlantic have revealed that they exhibit clear diurnal patterns: they are found much deeper during the daytime than at night. Spawning takes place in tropical waters when the environment is favorable. From nursery areas in tropical waters, juvenile fish tend to diffuse into temperate waters as they grow larger. Catch information from surface gears indicate that the Gulf of Guinea is a major nursery ground for this species. Dietary habits of bigeye tuna are varied and prey organisms like fish, mollusks, and crustaceans are found in their stomach contents. Bigeye tuna exhibit relatively fast growth: about 105 cm fork length at age three, 140 cm at age five and 163 cm at age seven. Bigeye tuna over 200 cm are relatively rare. Bigeye tuna become mature at about 3.5 years old. Young fish form schools mostly mixed with other tunas such as yellowfin tuna and skipjack. These schools are often associated with drifting objects, whale sharks and sea mounts. This association appears to weaken as bigeye tuna grow larger. Estimated natural mortality rates for juvenile fish, obtained from tagging data, were of a similar range as those applied in other oceans. Various pieces of evidence, such as a lack of identified genetic heterogeneity, the time-area distribution of fish and movements of tagged fish, suggest an Atlantic-wide single stock for this species, which is currently accepted by the Committee. However, the possibility of other scenarios, such as north and south stocks, should not be disregarded.

*BET-2. Fisheries Indicators*

The stock has been exploited by three major gears (longline, baitboat and purse seine fisheries) and by many countries throughout its range of distribution and ICCAT has detailed data on the fishery for this stock since the 1950s. Scientific surveys on-board purse seine vessels of the EU and associated fleets have been conducted since 1980 to estimate bigeye tuna catches (**BET-Figure 1, BET-Table 1**). The size of fish caught varies among fisheries: medium to large for the longline fishery, small to large for the directed baitboat fishery, and small for other baitboat and for purse seine fisheries.

The major baitboat fisheries are located in Ghana, Senegal, the Canary Islands, Madeira and the Azores. The tropical purse seine fleets operate in the Gulf of Guinea and off Senegal in the East Atlantic and off Venezuela in the West Atlantic. In the eastern Atlantic, these fleets are comprised of vessels flying flags of Ghana, EU-France, EU-Spain and others which are mostly managed by EC companies. In the western Atlantic the Venezuelan fleet dominates the purse-seine catch of bigeye tuna. While bigeye tuna is now a primary target species for most of the longline and some baitboat fisheries, this species has always been of secondary importance for the other surface fisheries. In the surface fishery, unlike yellowfin tuna, bigeye tuna are mostly caught while fishing on floating objects such as logs or man-made fish aggregating devices (FADs). During 2009, landings in weight of bigeye tuna caught by the longline fleets of Japan and Chinese Taipei, and the purse seine and baitboat fleets of the EU and Ghana represented 75 % of the total bigeye tuna catch.

The total annual Task I catch (**BET-Table 1, BET-Figure 2**) increased up to the mid-1970s reaching 60,000 t and fluctuated over the next 15 years. In 1991, catch surpassed 95,000 t and continued to increase, reaching a historic high of about 133,000 t in 1994. Reported and estimated catch has been declining since then and fell below 100,000 t in 2001. This gradual decline in catch has continued, although with some fluctuations from year to year, until the most recent year of data 2009. The preliminary estimate for 2009 is 86,011 t, the highest value in the last five years. This estimate includes preliminary estimates made for a few fleets that have not yet provided data to ICCAT.

After the historic high catch in 1994, all major fisheries exhibited a decline of catch while the relative share by each fishery in total catch remained relatively constant. These reductions in catch are related to declines in fishing fleet size (longline) as well as decline in CPUE (longline and baitboat). The number of active purse seiners declined by more than half from 1994 until 2006, but then increased since 2007 as some vessels returned from the Indian Ocean to the Atlantic. The number of purse seiners operating in 2009 and 2010 was similar to the number operating in 2003-04 (SKJ-Figure 6).

IUU longline catches were estimated from Japanese import statistics but the estimates are considered uncertain. These estimates indicate a peak in unreported catches of 25,000 t in 1998 and a quick reduction thereafter The Committee expressed concern that historical catches from illegal, unreported and unregulated (IUU) longliners that fly flags of convenience from the Atlantic might have been poorly estimated. The magnitude of this problem has not yet been quantified, because available statistical data collection mechanisms are insufficient to provide alternative means to calculate unreported catch.

Significant catches of small bigeye tuna continue to be channeled to local West African markets and sold as "*faux poissons*" in ways that make their monitoring and official reporting challenging. Monitoring of such catches has progressed in some countries but there is still a need for a coordinated approach that will allow ICCAT to properly account for these catches and thus increase the quality of the basic catch data available for assessments.

Mean average weight of bigeye tuna decreased prior to 1998 but has been relative stable, at around 10 kg during the last decade (BET-Figure 3). This weight, however, is quite different according to the fishing gear, around 62 kg for longliners, 7 kg for bait boats, and 4kg for purse seiners. In the last ten years all longline fleets have shown increases in mean weight of bigeye tuna caught, with the average longline-caught fish increasing from 40 kg to 60 kg between 1999 and 2009. During the same period purse seine-caught bigeye tuna had weights between 3 kg and 4 kg, with the exception of 2009 when the average weight was 4.5 kg. Bigeye tuna caught since 2004 in free schools are significantly larger than in previous years. Since FAD Catches began being identified separately in 1991, for most years the majority (75%-80%) of bigeye tuna caught by EU and associated fleets purse seine fleets are a result of sets associated with FADs. Similarly baitboat-caught bigeye tuna weighted between 6 and 10 kg over the same period, showing greater interannual variability in fish weight than longline or purse seine caught fish.

*BET-3. State of the stock*

The 2010 stock assessment was conducted using similar assessment models to those used in 2007 but with updated data and a few new relative abundance indices and data. In general, data availability has continued to improve, notably with the addition of relative abundance indices for an increasing number of fleets. There are still missing data on detailed fishing and fish size from certain fleets. In addition, there are a number of data gaps on the activities of IUU fleets (e.g., size, location and total catch). All these problems forced the committee to assume catch-at-size for an important part of the overall catch.

Three types of indices of abundance were used in the assessment. A number of indices were directly developed by national scientists for selected fleets for which data was available at greater spatial and or temporal resolution to that available in the ICCAT databases. These indices represented data for seven different fleets, all of them longline fleets, except for one baitboat fleet (BET-Figure 4). Other indices were estimated by the committee from data available within the ICCAT databases. These two types of indices were used for age-structured assessment models. Finally, a series of combined indices (BET-Figure 5) were calculated by the committee by synthesizing the information existing in individual indices for the seven fleets mentioned above. The later were used to fit production models.

Consistent with previous assessments of Atlantic bigeye tuna, the results from non-equilibrium production models are used to provide the basic characterization of the status of the resource. Results were sensitive to the combined abundance index trends assumed. As the relative likelihoods of each trend could not be estimated, results were developed from the joint distribution of model run results using each of three alternative combined indices. The plausible range of MSY estimated from the joint distribution using three types of abundance indices was between 71,000 and 101,000 tons (80% confidence limits) with a median MSY of 92,000 t. In addition, these estimates reflect the current relative mixture of fisheries that capture small or large bigeye tuna; MSY can change considerably with changes in the relative fishing effort exerted by surface and longline fisheries. Historical estimates show large declines in biomass and increases in fishing mortality, especially in the mid 1990s when fishing mortality exceeded $F_{MSY}$ for several years. In the last five or six years there have been possible increases in biomass and declines in fishing mortality (BET-Figure 6). The biomass at the beginning of

2010 was estimated to be at between 0.72 and 1.34 (80% confidence limits) of the biomass at MSY, with a median value of 1.01 and the 2009 fishing mortality rate was estimated to be between 0.65-1.55 (80% confidence limits) with a median of 0.95. The replacement yield for the year 2011 was estimated to be about MSY.

The Committee notes, as it did in previous assessments, that there is considerable uncertainty in the assessment of stock status and productivity for bigeye tuna. There are many sources of uncertainty including which method represents best the dynamics of the stock, which method is supported more by the available data, which relative abundance indices are appropriate to be used in the assessment, and what precision is associated with the measurement/calculation of each of the model inputs. In general, data availability has improved since 2007 but there is still a lack of information regarding detailed fishing effort and size data from certain fleets. This, combined with the lack of detailed historical information on catch and fishing activities of IUU fleets (e.g., size, location and total catch), forces the Committee to make many assumptions about the catch-at-size for an important part of the overall catch. In order to represent this uncertainty the Committee decided to combine sensitivity runs from a range of method/data combinations. There are differences in the estimates of management benchmarks, including the estimates of the current biomass and fishing mortality, depending on both the method used as well as the input data used (BET-Figure 7).

*BET-4. Outlook*

The outlook for Atlantic bigeye tuna, considering the quantified uncertainty in the 2010 assessment, is presented in **BET-Table 2** and **BET-Figure 8**, which provide a characterization of the prospects of the stock achieving or being maintained at levels consistent with the Convention Objective, over time, for different levels of future constant catch. It is noteworthy that the modeled probabilities of the stock being maintained at levels consistent with the Convention Objective over the next five years are about 60% for a future constant catch of 85,000 t. Higher odds of rebuilding to and maintaining the stock at levels that could produce MSY are associated with lower catches and lower odds of success with higher catches than such constant catch (**BET-Figure 9**). It needs to be noted that projections made by the Committee assume that future constant catches represent the total removals from the stock, and not just the TAC of 85,000 t established by ICCAT [Rec. 09-01]. Catches made by other fleets not affected by [Rec. 09-01] need to be added to the 85,000 t for comparisons with the future constant catch scenarios contemplated in BET-Table 2. Furthermore, any future changes in selectivity due to changes in the ratios of relative mortality exerted by the different fleets - such as an increase in the relative mortality of small fish - will change and add to the uncertainty of these projections.

*BET-5. Effects of current regulations*

During the period 2005-2008 an overall TAC for major countries was set at 90,000 t. The TAC was later lowered [09-01] to 85,000 t. Estimates of catch for 2005-2009 (**BET-Table 1**) seem to have been always lower than the corresponding TAC.

Concern over the catch of small bigeye tuna partially led to the establishment of spatial closures to surface fishing gear in the Gulf of Guinea [Rec. 04-01 and 08-01] The Committee examined trends in average bigeye tuna weight as a broad indicator of the effects of such closures. Although there have been significant changes in the average size of bigeye tuna caught since 2004 by certain fleets, such as increases in average size of fish caught by purse seiners operating in free schools and by longliners, it cannot be quantified whether changes are the result of spatial closures. The Committee also analyzed the ICCAT conventional tag database for evidence of an effect of spatial closures. Again, this analysis failed to provide any conclusive evidence in support of the hypothesis that spatial closures led to a reduction in the fishing mortality of juvenile bigeye tuna.

*BET-6. Management recommendations*

Projections indicate that catches reaching 85,000 t or less will promote stock growth and further reduce the chances in the future that the stock will not be at a level that is consistent with the convention objectives. The Commission should be aware that if major countries were to take the entire catch limit set under Recommendations 04-01 and 09-1 and other countries were to maintain recent catch levels, then the total catch could well exceed 100,000 t. The Committee recommends that the Commission sets a TAC at a level that would provide a high probability of maintaining at or rebuilding to stock levels consistent with the Convention objectives. In considering the uncertainty in assessment results, the Committee believes that a future total catch of 85,000 t or less would provide such high probability.

The assessment and subsequent management recommendations are conditional on the reported and estimated history of catch for bigeye tuna in the Atlantic. The Committee reiterates its concern that unreported catches, including those part of the *"faux poisson"* category, from the Atlantic might have been poorly estimated. There is a need to expand current statistical data collection mechanisms to fully investigate any evidence of significant catches that have been unreported.

| ATLANTIC BIGEYE TUNA SUMMARY | |
|---|---|
| Maximum Sustainable Yield | 78,700-101,600 t (median 92,000 t) [1,2] |
| Current (2009) Yield[3] | 86,011 t [2,3] |
| Replacement Yield (2011) | 64,900 – 94,000 (median 86,000 t) [1,2] |
| Relative Biomass ($B_{2009}/B_{MSY}$) | 0.72-1.34 (median 1.01) [1,2] |
| Relative Fishing Mortality $F_{2009}/F_{MSY}$ | 0.65-1.55 (median 0.95)[1,2] |
| Conservation & management measures in effect: | [Rec. 09-01], para. 1 of [Rec. 06-01] and [Rec. 04-01].<br>– Total allowable catch for 2010 is set at 85,000 t for Contracting Parties and Cooperating non-Contracting Parties, Entities or Fishing Entities.<br>– Limits on numbers of fishing vessels less than the average of 1991 and 1992.<br>– Specific limits of number of longline boats; China (45), Chinese Taipei (67), Philippines (10).<br>– Specific limits of number of purse seine boats; Panama (3).<br>– No purse seine and baitboat fishing during November in the area encompassed by 0°-5°N and 10° W- 20°W. |

[1] Production model (Logistic) results represent median and 80% confidence limits based on catch data for (1950-2009) and the joint distribution of bootstraps using each of three alternative combined indices.
[2] 80% confidence limits, MSY and replacement yield rounded to 100 t.
[3] Reports for 2009 should be considered provisional.

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*8.3 SKJ – SKIPJACK TUNA*

Stock assessments for eastern and western Atlantic skipjack were conducted in 2008 using available catches to 2006. Skipjack had only been assessed previously in 1999. Consequently, this report includes the most recent information on the state of the stocks on this species.

*SKJ-1. Biology*

Skipjack tuna is a gregarious species that is found in schools in the tropical and subtropical waters of the three oceans (**SKJ-Figure 1**). Skipjack is the predominant species under FADs where it is caught in association with juvenile yellowfin tuna, bigeye tuna and with other species of epipelagic fauna. One of the characteristics of skipjack is that from the age of one it spawns opportunistically throughout the year and in vast sectors of the ocean. A recent analysis of tagging data from the eastern Atlantic confirmed that the growth of skipjack varies according to the latitude. However, this difference in the growth rate is not as great as that which had been previously estimated.

The increasing use of fish aggregation devices (FADs) since the early 1990s, have changed the species composition of free swimming schools. It is noted that, in effect, the free schools of mixed species were considerably more common prior to the introduction of FADs. Furthermore, the association with FADs may also have an impact on the biology (food intake, growth rate, plumpness of the fish) and on the ecology (displacement rate, movement orientation) of skipjack and yellowfin (*ecological trap* concept).

*SKJ-2. Fisheries indicators*

The total catches obtained in 2009 in the entire Atlantic Ocean (including estimates of skipjack in the *faux-poisson* landed in Côte d'Ivoire by the EU-purse seiners) were close to 148,000 t (**SKJ-Table 1, SKJ-Figure 2**) which represents the catch average of the last five years.

The numerous changes that have occurred in the skipjack fishery since the early 1990s (such as the progressive use of FADs and the increase of the fishing area towards the west) have brought about an increase in skipjack catchability and in the biomass proportion that is exploited. At present, the major fisheries are the purse seine fisheries, particularly those of EU-Spain, Ghana, Panama, EU-France and Netherlands Antilles, followed by the baitboat fisheries of Ghana, EU-Spain, EU-Portugal and EU-France. The preliminary estimates of catches made in 2009 in the East Atlantic amounted to 122,000 t, that is, a catch on the order of the average of 2004-2008 (**SKJ-Figure 3**). In recent years, the seasonal fishing by European purse seiners on free schools, off Senegal, has increased sharply (**SKJ-Figure 1**) and consequently, the proportion of the catches on floating objects has continued to increase, reaching slightly more than 90% of the catches (**SKJ-Figure 4**).

The estimate of the average discard rate of skipjack tuna under FADs from data collected since 2001 by observers on-board Spanish purse seiners operating in the East Atlantic has been confirmed by the two new studies conducted on board French purse seiners (estimated at 42 kg per ton of skipjack landed). Furthermore, this last study showed that the amount of small skipjack (average size 37 cm FL) landed in the local market of Abidjan in Côte d'Ivoire as *faux-poisson* is estimated at 235 kg per ton of skipjack landed (i.e. an average of 6,641 t/year between 1988 and 2007, **SKJ-Figure 5**). The Committee integrated these estimates in the reported historical catches for the EU-purse seiners since 1981, as well as in the catch-at-size matrix.

In the West Atlantic, the major fishery is the Brazilian baitboat fishery, followed by the Venezuelan purse seine fleet. Estimates of catches in 2009 in the West Atlantic amounted to 26,000 t, i.e. a stable catch compared to the average observed for recent years (**SKJ-Figure 6**).

It is difficult to estimate effective fishing effort for skipjack tuna in the East Atlantic. Nominal purse seine effort, expressed in terms of carrying capacity, has decreased regularly since the mid-1990s up to 2006. However, due to acts of piracy in the Indian Ocean, many European Union purse seiners have transferred their effort to the East Atlantic. This new situation, which added to the presence of three new purse seiners operating from Tema (Ghana), has considerably increased the carrying capacity of this fishing gear (**SKJ-Figure 7**). The number of EU purse seiners in the East Atlantic follows this trend but seems to have stabilized in 2010, according to the preliminary estimates. On the other hand, baitboat nominal effort has remained stable for more than 20 years.

It is considered that the increase in fishing power linked to the introduction of innovation technologies on board the vessels as well as to the development of fishing under floating objects has resulted in an increase in the efficiency of the various fleets, since the early 1980s. In addition to the use of an average 3% annual increase in skipjack catchability to account for these changes, a new analysis has been conducted by fixing MSY and K at levels that agree with estimates made during previous stock assessments. This method provides a range of increase in catchability from 1 to 13% per year. It is unclear, however, whether these estimates reflect technological changes only, or also in the availability of the fish (e.g., resulting from an expansion of the surface exploited over the years; **SKJ-Figure 8**). The recent increase in the area explored successfully which corresponds to the extension of the fishery towards the central west Atlantic and off Angola should also be noted.

The significant increase in the estimates of total mortality (Z) between the early 1980s and the end of the 1990s obtained from different methods, such as the tag-recovery model, the catch curves by size and the average size observed in the yearly catches, supports this hypothesis. The change in the selectivity pattern observed for the purse seine fishery suggests that this fleet is mainly targeting juvenile tunas. The comparison of the size distributions of skipjack for the East Atlantic between the periods prior to, and following the use of FADs, also reinforces this interpretation insofar as an increase is observed in the proportion of small fish in the catches, as shown by the change of the average weight over the years (**SKJ-Figure 9**). Generally, it is noted that the average weight observed in the east Atlantic (close to 2 kg) is much lower than the estimates given in the other oceans (closer to 3 kg).

The regular increase in fishing pressure observed for the other indicators is confirmed up to about 1995, then the decline in apparent Z (a trend also observed for yellowfin) could be a consequence of the moratoria on floating objects which has mainly affected skipjack (**SKJ-Figure 10**).

With respect to the West Atlantic, the fishing effort of the Brazilian baitboats (i.e., the major skipjack fishery in this region) seems to be stable over the last 20 years.

*SKJ-3. State of the stocks*

In all the oceans and consequently in all the tuna RFMOs, the traditional stock assessment models have been difficult to apply to skipjack because of their particular biological and fishery characteristics (on the one hand, continuous spawning, areal variation in growth and non-directed effort, and on the other, weak identified cohorts). In order to overcome these difficulties, several different assessment methods which accommodate expert opinion and prior knowledge of the fishery and biological characteristics of skipjack have been carried out on the two stocks of Atlantic skipjack. Several fishery indicators were also analyzed for evidence of changes in the state of the stock over time.

Although the fisheries operating in the east have extended towards the west beyond 30°W longitude, the Committee decided to maintain the hypothesis in favor of two distinct stock units, based on available scientific studies. However, taking into account the state of current knowledge of skipjack tuna migrations and the geographic distances between the various fishing areas (**SKJ-Figure 1** and **SKJ-Figure 11**), the use of smaller stock units continues to be the envisaged working hypothesis.

*Eastern stock*

The Committee analyzed two standardized indices from the EU-purse seine fishery: An index accounts for skipjack caught in free school in the Senegalese area during the second quarter of the year and the second index characterizing small fish captured under FADs in the equatorial area (**SKJ-Figure 12**). In previous meetings of the Tropical Tunas Species Group it was confirmed that the increase in CPUE of the European purse seiners in the late 1990s was due, mainly, to the increase in the catches of positive sets under FADS (**SKJ-Figure 13**). Furthermore, the regular increase in the skipjack yields of the baitboats based in Senegal (contrary to the other two tropical tuna species) may only have been the result of an increase in catchability linked to the adoption of the so-called "baitboat associated school" fishing towards the mid-1980s (**SKJ Figure 14**). Furthermore, no marked trend has been observed for the Canary Islands baitboats as well as for a peripheral fishery such as the Azorean baitboat fishery. The fact that a reduction in abundance for a local segment of the stock would have little repercussion on abundance in other areas, leads to suppose that only a minor proportion of skipjack carry out extensive migrations between areas (**SKJ-Figure 11**; *cf.* notion of stock viscosity). This assumption was reinforced by a recent tagging study on growth variability of skipjack between two eastern Atlantic regions divided by 10°N latitude, which were established on the basis of their low amount of mixing (only 0.9% of the tagged fish crossed this latitudinal limit).

A new bayesian method, using only catch information (under a Schaefer-type model parameterization), estimated the MSY at 143,000-156,000 t, a result which agrees with the estimate obtained by the modified Grainger and Garcia approach: 149,000 t.

In addition, two non-equilibrium surplus biomass production models (a multi-fleets model and a Schaefer-based model) were applied for 8 time series of CPUEs, and for a combined CPUE index weighted by fishing areas. To account for the average increase in catchability of purse seine fisheries, a correction factor of 3% per year was applied to the CPUE series. As for the bayesian model application that only uses catches, different working hypothesis were tested on the distribution of the priors of the two surplus production models (i.e., the growth rate, the carrying capacity, the catchability coefficient of each fleet, etc.). In general, the range of plausible MSY values estimated from these models (155,000-170,000 t) were larger than in the bayesian model based on catches. The Committee stated the difficulty to estimate MSY under the continuous increasing conditions of the exploitation plot of this fishery (one-way of the trajectory to substantially weaker effort values) and which as a result, the potential range distribution of some priors needs to be constrained (e.g., for growth rate, or for the shape parameter of the generalized model).

While caution is needed as regards to the generalization of the diagnosis on the stock status of the overall components of this stock in the East Atlantic, due to the moderate mixing rates that seem to occur among the different sectors of this region, it is unlikely that skipjack be exploited in the eastern Atlantic (**SKJ-Figure 15**).

*Western stock*

The standardized CPUEs of Brazilian baitboats remain stable while that of Venezuelan purse seiners and USA rod and reel decreased in recent years (**SKJ-Figure 16**). This decrease, also observed in the

CPUE time series for Venezuelan purse seine, could be linked to specific environmental conditions (high surface temperatures, lesser accessibility of prey). The average weight of skipjack caught in the western Atlantic is higher than in the east (3 to 4.5 kg vs. 2 to 2.5 kg), at least for the Brazilian baitboat fishery.

The assessment model from catches estimated MSY at around 30,000 t (similar to the estimate provided by the Grainger and Garcia approach) and the Bayesian surplus model (Schaefer formulation) at 34,000 t.

The Group attempted several sensitivity analyses for values of natural mortality with Multifan-CL. For this stock only the three fisheries mentioned above were considered. The final estimate of MSY converges also at about: 31,000-36,000 t. It must be stressed that all of these analyses correspond to the current geographic coverage of this fishery (i.e., relatively coastal fishing grounds due to the deepening of the thermocline and of the oxycline to the East).

For the western Atlantic stock, in the light of the information provided by the trajectories of $B/B_{MSY}$ and $F/F_{MSY}$, it is unlikely that the current catch is larger than the current replacement yield (**SKJ-Figure 17**).

*SKJ-4. Effects of current regulations*

There is currently no specific regulation in effect for skipjack tuna.

However, with the aim of protecting juvenile bigeye tuna, the French and the Spanish boat owners voluntarily decided to apply a moratorium for fishing under floating objects between November and the end of January for the 1997-1998 and 1998-1999 periods. The Commission implemented a similar moratorium from 1999 to January 2005. This moratorium has had an effect on skipjack catches made with FADs.

On the basis of a comparison of average catches between 1993-1996, prior to the moratoria, and those between the 1998-2002 period, the average skipjack catches between November and January for the purse seine fleets that applied the moratoria, were reduced by 64%. During that period (1998-2002), the average annual skipjack catches by purse seine fleets that applied the moratoria decreased by 41% (42,000 t per year). However, this decrease is possibly a combined result of the decrease in effort and the impact of the moratoria (the average annual catch per boat decreased only 18% between these two periods).

The repealing in 2006 of Recommendation [Rec. 05-01] on the 3.2 kg minimum size limit on yellowfin tuna [Rec. 72-01] (although it remained in force in 2005) and the establishment of a time/area closure of the surface fishery [Rec. 04-01], which replaces the old strata relative to the moratorium on catches under floating objects, are regulatory measures whose effects were analyzed during the Species Group meeting.

Considering that the new closed area is much smaller in time and surface than the previous moratorium time/area, and is located in an area which historically has lower effort anyway, this regulation is likely to be less effective in reducing the overall catches of small bigeye (the species for which the regulation was applied) by the surface fishery. When the fishing effort for the EU purse seine fleet was at its maximum value (period 1994-1996, i.e., before the implementation of the first moratorium), the skipjack catch from this fleet within the time and area limits defined by Rec. 04-01, was only on average at 7,180 t (i.e., 7.5% of the total skipjack catch from the EU purse seiners).

*SKJ-5. Management recommendations*

Although the Committee makes no management recommendations in this respect, catches should not be allowed to exceed MSY. The Commission should be aware that increasing harvests and fishing effort for skipjack could lead to involuntary consequences for other species that are harvested in combination with skipjack in certain fisheries.

**ATLANTIC SKIPJACK TUNA SUMMARY**

| | East Atlantic | West Atlantic |
|---|---|---|
| Maximum Sustainable Yield (MSY) | Around 143,000-170,000 t | Around 30,000-36,000 t |
| Current (2009) Yield[1] | 122,000 t | 26,000 t |
| Current Replacement Yield | somewhat higher than 122,000 t | somewhat higher than 26,000 t |
| Relative Biomass ($B_{2009}/B_{MSY}$) | most likely>1 | most likely>1 |
| Relative Fishing Mortality: ($F_{2009}/F_{MSY}$) | most likely<1 | most likely<1 |
| Management measures in effect | Rec. 04-01 (effective 2005)[2] | None |

[1] Reports for 2009 should be considered provisional.
[2] Although this time-area measure was implemented to reduce mortality on bigeye juvenile tuna, a total area closure has the expected effects on all the tropical tuna species.

SKJ-Table 1. Estimated catches (t) of skipjack tuna (Katsuwonus pelamis) by area, gear and flag.
SKJ-Tableau 1. Prises estimées (t) de listao (Katsuwonus pelamis) par zone, engin et pavillon.
SKJ-Tabla 1. Capturas estimadas (t) de listado (Katsuwonus pelamis) por area, arte y bandera.

| | | | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL | | | 119021 | 122865 | 119229 | 144796 | 120419 | 144471 | 219733 | 170708 | 205585 | 185014 | 167381 | 154127 | 146082 |
| | ATE | | 78756 | 90711 | 95052 | 122060 | 94017 | 118351 | 185330 | 140554 | 172462 | 155065 | 145475 | 126557 | 114367 |
| | ATW | | 40273 | 32151 | 24164 | 22736 | 26382 | 26130 | 33404 | 30155 | 33221 | 29949 | 21866 | 27561 | 31712 |
| | MED | | 13 | 2 | 13 | 0 | 0 | 6 | 0 | 0 | 2 | 0 | 43 | 9 | 4 |
| Landings | ATE | Bait boat | 29503 | 36009 | 38503 | 48015 | 41000 | 34922 | 41611 | 35060 | 31656 | 37817 | 33691 | 32047 | 37293 |
| | | Longline | 6 | 19 | 6 | 4 | 9 | 8 | 5 | 3 | 2 | 10 | 3 | 7 | 47 |
| | | Other surf. | 206 | 1638 | 1027 | 1566 | 1543 | 1357 | 2067 | 1603 | 1362 | 501 | 445 | 501 | 304 |
| | | Purse seine | 48736 | 59045 | 55256 | 71535 | 51365 | 83087 | 142646 | 103258 | 139741 | 116237 | 111340 | 94002 | 76722 |
| | ATW | Bait boat | 23490 | 25776 | 18675 | 21057 | 25292 | 22245 | 23972 | 20352 | 19697 | 22645 | 17744 | 23741 | 26797 |
| | | Longline | 24 | 8 | 6 | 9 | 25 | 23 | 33 | 29 | 20 | 16 | 34 | 15 | 12 |
| | | Other surf. | 567 | 1657 | 578 | 355 | 600 | 600 | 872 | 764 | 710 | 1577 | 2085 | 452 | 556 |
| | | Purse seine | 11191 | 5262 | 4564 | 2315 | 2466 | 3041 | 8527 | 8505 | 12794 | 5712 | 2059 | 3345 | 4347 |
| | MED | Bait boat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Other surf. | 13 | 2 | 13 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 43 | 9 | 4 |
| | | Purse seine | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Landings | ATE | Angola | 131 | 56 | 80 | 30 | 85 | 69 | 66 | 41 | 13 | 7 | 3 | 15 | 57 |
| | | Benin | 20 | 11 | 5 | 3 | 7 | 7 | 2 | 2 | 7 | 2 | 2 | 2 | 7 |
| | | Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Cape Verde | 2030 | 877 | 2096 | 1456 | 971 | 506 | 1333 | 554 | 660 | 1007 | 1314 | 470 | 591 |
| | | Cayman Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | China P.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Chinese Taipei | 4 | 0 | 0 | 1 | 3 | 0 | 5 | 3 | 2 | 10 | 5 | 5 | 47 |
| | | Congo | 5 | 8 | 2 | 8 | 11 | 12 | 5 | 9 | 10 | 7 | 7 | 6 | 0 |
| | | Cuba | 246 | 569 | 81 | 296 | 331 | 86 | 8 | 0 | 7 | 0 | 0 | 0 | 0 |
| | | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Bulgaria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.España | 35100 | 41992 | 33076 | 47643 | 35306 | 47634 | 79908 | 53359 | 63668 | 50538 | 51594 | 36538 | 38513 |
| | | EU.Estonia | 0 | 0 | 0 | 0 | 0 | 0 | 102 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.France | 13645 | 13045 | 17314 | 16504 | 15211 | 17099 | 33271 | 21890 | 33735 | 32779 | 25162 | 23107 | 17023 |
| | | EU.Germany | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| | | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Latvia | 0 | 0 | 0 | 0 | 0 | 0 | 92 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Lithuania | 0 | 0 | 0 | 0 | 0 | 0 | 221 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | EU.Portugal | 2409 | 5446 | 8430 | 14257 | 7226 | 3987 | 6059 | 7427 | 5651 | 7528 | 4996 | 3202 | 4399 |
| | | Gabon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 11 | 51 | 26 | 0 |
| | | Ghana | 15082 | 22268 | 24347 | 26597 | 22751 | 24251 | 25057 | 15057 | 20025 | 21258 | 18600 | 19602 | 26336 |
| | | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Guinea Ecuatorial | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Japan | 3006 | 2331 | 3982 | 3209 | 2243 | 2565 | 4792 | 2878 | 0 | 0 | 0 | 0 | 0 |
| | | Korea Rep. | 153 | 5 | 6 | 3 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Maroc | 1002 | 1220 | 1028 | 428 | 254 | 1197 | 354 | 597 | 310 | 248 | 4981 | 675 | 4505 |
| | | Mixed flags (FR+ES) | 358 | 692 | 4463 | 4600 | 4525 | 5200 | 11101 | 12273 | 12350 | 9492 | 5262 | 5831 | 4985 |
| | | NEI (ETRO) | 590 | 560 | 291 | 2994 | 3203 | 10869 | 11335 | 12409 | 20091 | 17418 | 16715 | 16411 | 6601 |
| | | Namibia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 15 | 0 | 1 |
| | | Netherlands Antilles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7006 | 8444 |
| | | Norway | 0 | 0 | 581 | 735 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 8312 | 8769 | 15027 | 12978 | 14853 | 5855 | 1300 |
| | | Romania | 0 | 3 | 0 | 0 | 59 | 142 | 349 | 73 | 0 | 0 | 0 | 0 | 0 |
| | | Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 1175 | 1110 | 540 | 1471 | 1450 | 381 | 1166 |
| | | S. Tomé e Príncipe | 20 | 20 | 20 | 195 | 196 | 204 | 201 | 178 | 212 | 190 | 182 | 187 | 178 |
| | | Senegal | 0 | 0 | 0 | 0 | 47 | 134 | 652 | 260 | 55 | 59 | 18 | 163 | 455 |
| | | South Africa | 66 | 101 | 88 | 157 | 96 | 37 | 15 | 7 | 6 | 4 | 4 | 1 | 6 |
| | | St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | U.S.S.R. | 1404 | 1686 | 547 | 1822 | 1915 | 3035 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL | | | 151695 | 146455 | 148665 | 155767 | 116781 | 145293 | 155707 | 162240 | 143176 | 139127 | 149242 | 148222 |
| | ATE | | 122436 | 139079 | 119269 | 124239 | 95145 | 120432 | 131085 | 133596 | 115701 | 113585 | 127153 | 122470 |
| | ATW | | 29059 | 27336 | 29307 | 31451 | 21600 | 24749 | 21461 | 28517 | 26453 | 25443 | 22071 | 25747 |
| | MED | | 176 | 53 | 90 | 77 | 37 | 132 | 161 | 127 | 22 | 104 | 67 | 5 |
| Landings | ATE | Bait boat | 42045 | 37606 | 29774 | 40281 | 27591 | 25347 | 39559 | 43508 | 41175 | 29729 | 44166 | 33580 |
| | | Longline | 85 | 42 | 48 | 51 | 56 | 66 | 316 | 453 | 2458 | 1590 | 1153 | 1559 |
| | | Other surf. | 923 | 417 | 2423 | 764 | 681 | 551 | 816 | 1897 | 2402 | 2372 | 9419 | 4869 |
| | | Purse seine | 79381 | 100925 | 86783 | 77142 | 66217 | 89983 | 90414 | 87438 | 66170 | 79894 | 72473 | 82461 |
| | ATW | Bait boat | 24724 | 23581 | 25754 | 25142 | 18737 | 21990 | 24087 | 26026 | 23749 | 22865 | 20617 | 22776 |
| | | Longline | 21 | 58 | 22 | 60 | 349 | 95 | 296 | 207 | 286 | 52 | 50 | 20 |
| | | Other surf. | 516 | 431 | 467 | 931 | 394 | 367 | 404 | 316 | 372 | 1317 | 455 | 925 |
| | | Purse seine | 3526 | 2936 | 5063 | 5297 | 2116 | 2295 | 2765 | 1967 | 2345 | 1209 | 901 | 2022 |
| | MED | Bait boat | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Longline | 0 | 0 | 0 | 0 | 3 | 17 | 21 | 13 | 8 | 39 | 40 | 1 |
| | | Other surf. | 176 | 53 | 90 | 77 | 32 | 12 | 40 | 16 | 11 | 28 | 11 | 3 |
| | | Purse seine | 0 | 0 | 0 | 0 | 2 | 103 | 101 | 99 | 0 | 38 | 16 | 1 |
| Landings | ATE | Angola | 2 | 32 | 14 | 14 | 16 | 14 | 10 | 0 | 0 | 0 | 0 | |
| | | Benin | 3 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Cape Verde | 684 | 962 | 789 | 794 | 398 | 343 | 1097 | 7504 | 7930 | 6026 | 6010 | 4367 |
| | | Cayman Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | China P.R. | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Chinese Taipei | 73 | 39 | 41 | 24 | 23 | 25 | 16 | 10 | 9 | 14 | 18 | 5 |
| | | Congo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Cuba | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Côte D'Ivoire | 0 | 0 | 1173 | 259 | 292 | 145 | 555 | 1259 | 1565 | 1817 | 1598 | 2940 |
| | | EU.Bulgaria | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.España | 36008 | 44520 | 37225 | 30954 | 25455 | 44831 | 38325 | 28159 | 22286 | 23570 | 35106 | 36694 |
| | | EU.Estonia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.France | 16582 | 20444 | 15183 | 16595 | 16615 | 19899 | 21873 | 14852 | 7034 | 4168 | 4419 | 3615 |
| | | EU.Germany | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 54 | 16 | 0 | 0 | 8 |
| | | EU.Latvia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Lithuania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Portugal | 4544 | 1810 | 1302 | 2167 | 2955 | 4315 | 5504 | 4735 | 11158 | 8995 | 6052 | 1084 |
| | | Gabon | 59 | 56 | 21 | 101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Ghana | 34183 | 40216 | 28974 | 42469 | 30499 | 24597 | 25727 | 44671 | 30236 | 34572 | 37157 | 36064 |
| | | Guatemala | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6389 | 5162 | 5546 | 6319 | 4036 |
| | | Guinea Ecuatorial | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1224 |
| | | Japan | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 |
| | | Korea Rep. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Maroc | 2481 | 548 | 1195 | 262 | 280 | 525 | 507 | 1933 | 3779 | 1570 | 1291 | 2575 |
| | | Mixed flags (FR+ES) | 5921 | 6845 | 5461 | 7177 | 2595 | 4959 | 5243 | 4666 | 5515 | 3275 | 3128 | 2969 |
| | | NEI (ETRO) | 6742 | 5593 | 7127 | 8122 | 8550 | 9665 | 11137 | 2573 | 639 | 0 | 0 | |
| | | Namibia | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71 |
| | | Netherlands Antilles | 8553 | 9932 | 10008 | 13370 | 5437 | 10092 | 3706 | 0 | 3047 | 1587 | 6436 | 9143 |
| | | Norway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Panama | 572 | 1306 | 1559 | 231 | 342 | 0 | 7126 | 11690 | 13455 | 18321 | 5253 | 8515 |
| | | Romania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Russian Federation | 2086 | 1426 | 374 | 0 | 0 | 0 | 0 | 0 | 992 | 1130 | 0 | 260 |
| | | S. Tomé e Príncipe | 169 | 181 | 179 | 179 | 179 | 179 | 177 | 166 | 143 | 0 | 0 | |
| | | Senegal | 1560 | 1601 | 1506 | 1271 | 1053 | 793 | 1333 | 4874 | 3534 | 2278 | 3661 | 4573 |
| | | South Africa | 2 | 1 | 7 | 1 | 1 | 2 | 2 | 1 | 0 | 0 | 4 | 4 |
| | | St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | U.S.S.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

Original: English

*8.4 ALB – ALBACORE*

The status of the North Atlantic albacore stock is based on the most recent analyses conducted in July 2009 by means of applying statistical modelling to the available data up to 2007. Complete information on the assessment can be found in the Report of the 2009 ICCAT Albacore Stock Assessment Session (SCRS/2009/015, Anon., 2010).

The status of the South Atlantic albacore stock is based on the 2007 assessment using available data up to 2005. Complete information is found in the Report of the 2007 ICCAT Albacore Stock Assessment Session (SCRS/2007/015).

This year a Mediterranean Albacore Data Preparatory Meeting was held, following the 2009 recommendations of the Albacore Species Group. However, no assessment was conducted. Complete information is found in document SCI-032.

*ALB-1. Biology*

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. On the basis of the biological information available for assessment purposes, the existence of three stocks is assumed: northern and southern Atlantic stocks (separated at 5°N) and Mediterranean stock (**ALB-Figure 1**). However, the hypothesis that various sub populations of albacore have been exploited in the North Atlantic (Aloncle & Delaporte 1973) remains of potential interest in the stock assessment. Likewise, there is likely intermingling of Indian Ocean and South Atlantic immature albacore which needs further research.

Scientific studies on albacore stocks, in the north Atlantic as well as in the North Pacific, have been showing that trends in environmental variability may have a serious potential impact on albacore stocks, affecting fisheries by changing the fishing grounds as well as recruitment levels and potential MSY of the stocks. Those unexplored aspects might explain changes in fisheries and the apparent decline in the estimated recruitment which are demanding focussed research.

The expected life-span for albacore is around 15 years. While albacore is a temperate species, spawning occurs in tropical waters. A new weight-at-length relationship for the western Atlantic fishery was presented that showed to be different from that presently used for the northern stock. Present available knowledge on habitat distribution according to size, spawning areas and maturity estimates of Atlantic albacore is based on limited studies from past decades.

An exception is a revised, new growth equation for the South stock. For Mediterranean albacore, the available biological knowledge has not yet been fully analyzed by the Albacore Species Group. More information on albacore biology and ecology is published in the *ICCAT Manual*.

*ALB-2. Description of fisheries or fisheries indicators*

*North Atlantic*

The northern stock is exploited by surface fisheries targeting mainly immature and sub-adult fish (50 cm to 90 cm FL) and longline fisheries targeting immature and adult albacore (60 cm to 130 cm FL). The main surface fisheries are carried out by EU fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the northeast Atlantic and in the vicinity of the Canary and

Azores Islands in summer and autumn. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year round. However, Chinese Taipei fishing effort decreased in late 1980s due to a shift towards targeting on tropical tuna, then continued at this lower level to the present. Over time, the relative contribution of different fleets to the total catch of North Atlantic albacore has changed, which resulted in differential effects on the age structure of the stock.

The historical time series of catch was extended back to 1930 for the troll fishery after revision of data for the assessment. Total reported landings for the North Atlantic generally began to decline after 1986, largely due to a reduction of fishing effort by the traditional surface (troll and baitboat) and longline fisheries (**ALB-Table 1; ALB-Figure 2a**). Some stabilization was observed in the 1990s, mainly due to increased effort and catch by new surface fisheries (driftnet and mid-water pair pelagic trawl) with a maximum catch in 2006 at 36,989 t and since then a decreasing trend of catch is observed in the North Atlantic.

The total catch in 2009 was 15,364 t, representing a decrease of 25% compared to the 2008 yield and a larger decrease from the 2006 peak catch (36,989 t). The catch in 2009 was the lowest recorded in the time series since 1950.

The surface fisheries accounted for the bulk of the total catch with 12,911 t reported in 2009 (81%) (**ALB-Table 1**). The reported catch for EU-France in 2009 was 1,122 t, a decrease from 2008. The reported catch for EU-Spain in 2009 was 9,376 t from the troll fleet and baitboat fleets in the summer Cantabrian Sea fishery (SCRS/2010/145) and the baitboat fishery in the Canary Islands (SCRS/2010/144). It represents a decrease from the 2008 catch. In contrast, EU-Ireland 2009 reported catches had increased compared to 2008 and by two and a half fold from 2007. The EU-Portugal catch from the baitboat fishery in 2009 was 108 t, a five-fold decrease from 2008.

Standardized catch rates of fish ages 1 to 4 from the Spanish troll fleet were updated to 2009 (SCRS/2010/146). Albacore age 1 showed an increasing trend peaking in 2005 and 2006, fluctuating since then and a decreasing trend in 2009. Age 2 albacore showed an increasing trend since 2004 with peaks in 2006 and 2008 and a decreasing trend in 2009. In the case of age 3, there is a continued upward trend from 2007 to 2009. Catch rates of the Irish mid-water pelagic trawl fleet showed a steep decline in 2007 compared to the higher estimates for 2005 and 2006.

In total, the 2009 longline catches were similar to 2007. The Chinese Taipei catch in 2009 was 863 t, a decrease of 244 t as compared with that of 2008. The decrease in catch mainly stemmed from a reduction in fishing effort. Japan takes albacore as by-catch with longline gear. The Japanese longline catch reached 285 t in 2009, which represented a 30% decrease from 2008. The catch fluctuated from around 300 t to 1,300 t in the last decade. Recent catch rates from the Chinese Taipei longline fishery in 2008 showed the same level as in 2007 (SCRS/2009/105).

The trend in mean weight for all surface fleets (baitboat, troll, mid-water, pair pelagic and other surface) from 1975 to 2007 showed a stable trend with an average of 7 kg (range:4-10). For longline fleets from 1975 to 2005 the mean weight was also relatively stable with an average of 18.8 kg (range: 13.4-25.7 kg) (**ALB-Figure 3a**).

*South Atlantic*

The recent total annual South Atlantic albacore landings were largely attributed to four fisheries, namely the surface baitboat fleets of South Africa and Namibia, and the longline fleets of Brazil and Chinese Taipei (**ALB-Table 1; ALB-Figure 2b**). The surface fleets are entirely albacore directed and mainly catch juvenile and sub-adult fish (70 cm to 90 cm FL). These surface fisheries operate seasonally, from October to May, when albacore are available in coastal waters. Brazilian longliners target albacore during the first and fourth quarters of the year, when an important concentration of adult fish (> 90 cm ) is observed off the northeast coast off Brazil, between 5°S and 20°S, being likely related to favorable environmental conditions for spawning, particularly of sea surface temperature. The longline Chinese Taipei fleet operates over a larger area and throughout the year, and consists of vessels that target albacore and vessels that take albacore as by-catch, in bigeye directed fishing operations. On average, the longline vessels catch larger albacore (60 cm to 120 cm FL) than the surface fleets.

Total reported albacore landings for 2009 were 22,856 t an increase of about 21% from 2008 catch. The Chinese Taipei catch in 2009 was 8,678 t, a decrease of 1,288 t as compared to that of 2008. This decrease mainly stemmed from a decrease in fishing effort targeting albacore. Chinese Taipei longliners (including boats flagged Belize and St. Vincent & the Grenadines) stopped fishing for Brazil in 2003, which resulted in albacore only being caught as by-catch in tropical tuna-directed longline fisheries. Albacore is only caught as by-catch in Brazilian tropical tuna-directed longline and baitboat fisheries. In 2009, the catch of the Brazilian fishery was 202 t, showing a decrease of about 50% compared to 2008. The average catch of about 4,287 t during the period 2000-2003 was obtained by the longline Brazilian fleet when albacore was a target species. In 2009, Uruguay reported 685 t, which represent an extremely high increase from previous reported years.

In 2009, South Africa estimated the total annual catch taken by the baitboat fleet was 5043 t, which represented an increase of about 45% from 2008. In addition, in 2009 the Namibian total reported catch by the baitboat fleet was 4,936 t, an increase of two and a half fold from 2008. Japan takes albacore as by-catch using longline gear. In 2009, the Japanese longline catch was 949 t, a decrease from 2008. The relatively large increase from 238 t in 2007 was due to an increase in fishing effort in the waters off southern Africa (20-40°S). Recent CPUEs from the Chinese Taipei longline fishery in 2008 showed the same level as in 2007 (SCRS/2009/107).

The trend in mean weight for all surface fleets (baitboat and other surface fleets) from the 1975 to 2005 period is shown in **ALB-Figure 3b**. From 1981 onwards a stable trend is identified with an average of 13.4 kg and maximum and minimum weight of 17.6 kg and 11 kg, respectively. While the trend in mean weight for longline fisheries showed an increase after 1996.

*Mediterranean*

In 2009, the reported landings were 4,021 t, an increase from 2,970 t taken in 2008 (**ALB-Table 1** and **ALB-Figure 2c**). The majority of the catch came from longline fisheries.

## *ALB-3. State of stocks*

A thorough revision of North Atlantic Task I and Task II data was conducted and a more robust method for catch-at-size analyses was implemented for the 2009 assessment session similar to that used in the 2007 assessment. In addition, catch rate analyses were improved and updated with new information for the northern albacore fisheries and substantial effort was undertaken to implement assessment methods which do not assume that catch-at-age is perfectly known. The analyses were also conducted to incorporate longer time-series of catch, effort and size information into the assessment to guide the evaluation. The approach provided the opportunity to evaluate a range of hypothesis about how the fisheries operated over time and their impact on the population. The results of these efforts are reflected in the following summaries of stock status that analyzed data through 2007.

*North Atlantic*

The CPUE trends for the various surface fleets, based upon the most recent available 2007 data showed somewhat different patterns from each other. This was also the case for the different longline fleets (**ALB-Figure 4**). The Spanish age two troll CPUE series showed evidence of a relatively strong 2003 year class entering the fishery. For the Spanish age three troll CPUE series, the age signal is not as strong, leading to uncertainty about the possibility of a good year class. For the longline fleets, the general trend in CPUE indices is a decline over time, with varying rates. Given the variability associated with these catch rate estimates, definitive conclusions about recent trends could not be reached just by examining the CPUE trends alone which represent different parts of the population.

The data sets used for the analyses from 1930 to 2007 were compiled during the July 2009 stock assessment meeting. The data was classified into 10 fisheries units using the same definitions as those used in the 2007 stock assessment. The basic input data, catch, effort and catch-at-size were revised due to updates in the ICCAT Task I (**Table 1**) and Task II database. Model specification for the base case was identical to the 2007 assessment and described in detail in document SCRS/2009/108, however the model was run using the latest version of the software. Different hypothesis on the dynamics of the northern albacore stock were tested and those with clearly unrealistic outputs were discarded.

Based on the present assessment which considers catch and effort since the 1930s and size frequency since 1959, the view of the northern albacore resource status is that spawning stock size has declined and in 2007 was about one third of the peak levels estimated for the late-1940s. Estimates of recruitment to the fishery, although variable, have shown generally higher levels in the 1960s and earlier periods with a declining trend thereafter until 2007. The most recent recruitment is estimated to be the lowest for all the years of the evaluation although the magnitude of this year-class is highly uncertain in the latest year (**ALB-Figure 5**). The 2009 current assessment indicated that the stock has remained below $B_{MSY}$ (current $SSB_{2007}$ is approximately 62% of SSB at MSY) (**ALB-Figure 5**) since the late 1960. Corresponding fishing mortality rates have been above $F_{MSY}$ (current ratio $F_{2007}/F_{MSY}$ is 1.05 which is only slightly higher than $F_{MSY}$. (**ALB-Figure 6**).

The trajectory of fishing mortality and spawning stock biomass relative to MSY reference points, from the assessment model is shown in **ALB-Figure 6**. As the majority of the time series is in the top left quadrant ($F/F_{MSY} > 1$ and, $SSB/SSB_{MSY} < 1$) this could indicate the northern albacore stock has been overfished ($SSB/SSB_{MSY} < 1$) since the mid-1980s. Uncertainty around the estimates of current $F_{2007}/F_{MSY}$ and $SSB_{2007}/SSB_{MSY}$ is shown in (**ALB-Figure 7**).

*South Atlantic*

In 2003, the Committee assessed the status of the southern Atlantic albacore stock using the same specifications as were used in 2000, but with updated data. Because of the detailed review, revisions, and updates of the data since that time, the Committee was able to incorporate additional information into the model used for assessing the southern Albacore stock and incorporated an assessment methodology that more objectively brought information about fishery selectivity into the evaluation.

The southern CPUE trends, mainly based on an updated longline standardized CPUE series up to 2007 which harvest mostly mature albacore, showed a strong declining trend in the early part of the time series, and less steep decline over the past decade; while those from the surface fishery, harvesting mostly juvenile albacore, are more recent and show no apparent trend (**ALB-Figure 8**).

Based on the 2007 assessment which considers catch, size and effort since the 1950s, our view of the southern albacore resource status stock is that the spawning stock has declined to about 25% of its unfished level in 2005 (**ALB-Figure 9**). The Committee concluded that it is likely that the stock was below the maximum sustainable yield (MSY) level as it was estimated to about 90% of $B_{MSY}$ in 2005, while the 2005 fishing mortality rate was about 60% of $F_{MSY}$. MSY was estimated to be around 33,300 t, whereas the replacement yield averaged over the last 10 years, is approximately 29,000 t.

Distribution of the pairs of current 2005 status of catch and fishing mortality ratios estimated from the production model are displayed to show the uncertainty around the estimates (**ALB-Figure 10**).

*Mediterranean*

In 2010, Mediterranean albacore Task I and Task II data were reviewed. As a result, deficiencies and a lack of information were identified on statistics from major fleets. The detailed information is presented in report SCI-032. In order to asses the status of this stock, the CPCs should provide revised and complete data for this purpose.

*ALB-4. Outlook*

*North Atlantic*

Using the reference points calculated by the current base case assessment model done in 2009, projections (SCRS/2009/164) indicate that constant catches above 28,000 t will not result in stock rebuilding to Convention standards by 2020 (**ALB-Figure 11**). In 2008 and 2009 catches were lower than 28,000 t.

*South Atlantic*

The assessment indicates that the spawning stock will increase from the levels estimated in 2005 over the next few years, assuming catches in 2006 and 2007 remain about the 2005 level, which is below the estimated replacement yield of about 29,000 t. Since then catches had been lower than 29,000 t (**ALB-Figure 9**)

*ALB-5. Effects of current regulations*

*North Atlantic*

In 2007, the Commission established a new TAC for 2008 and 2009 of 30,200 t [Rec. 07-02], but included several provisions that allow the catch to exceed this level.

Furthermore, a 1998 recommendation that limits fishing capacity to the average of 1993-1995, remains in force.

The Committee noted that the reported catches of 20,449 t in 2008 were below the recommended TAC and in 2009 the total catch of 15,364 t was again lower than the TAC. (**ALB-Table 1**).

*South Atlantic*

In 2007 the Commission established a new TAC from 2008 to 2011 of 29,900 t [Rec. 07-03]. The Committee noted that reported catches in 2008 and 2009 were well below the TAC (**ALB-Table 1**).

*Mediterranean*

There are no ICCAT regulations directly aimed at managing the Mediterranean albacore stock.

*ALB-6. Management recommendations*

*North Atlantic*

In 2007, the Commission implemented [Rec. 07-02], intended to reduce the TAC to 30,200 t in 2008 and 2009 and allow the rebuilding of the northern albacore stock from the overfished condition. However, it was reiterated that the fishing opportunities provided in [Rec. 07-02] allow the potential catch to exceed the TAC (**ALB-Figure 2a**). In view of the 2009 assessment, in order to achieve the Commission management objective by 2020, a level of catch of no more than 28,000 t will be required. The Commission recommended the establishment of a Total Allowable Catch (TAC) of 28,000 t for 2010 and 2011 [Rec. 09-05].

*South Atlantic*

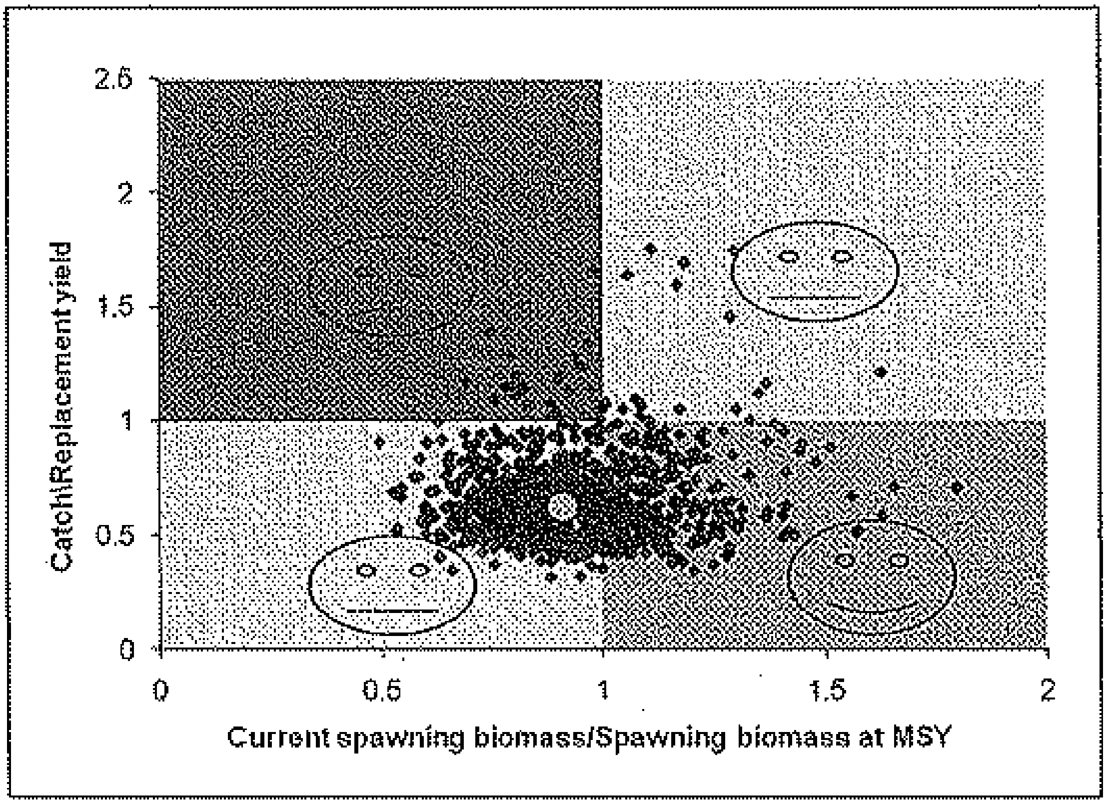
In the case of the southern stock, the present TAC is 29,900 t. Recent catches were below the TAC level. The 2007 assessment showed that the southern stock was overfished and model projections indicated that catches, at about the 2006 level (24,452 t), will recover the stock..

The Committee considered that the current management regulations are sufficient for the recovery of the southern stock. In 2007, the Commission recommended [Rec. 07-03] adopting a catch limit of 29,900 t (the lowest estimate of MSY) until 2011. The Commission recommended updating the southern albacore stock assessment in 2011 [Rec. 07-03].

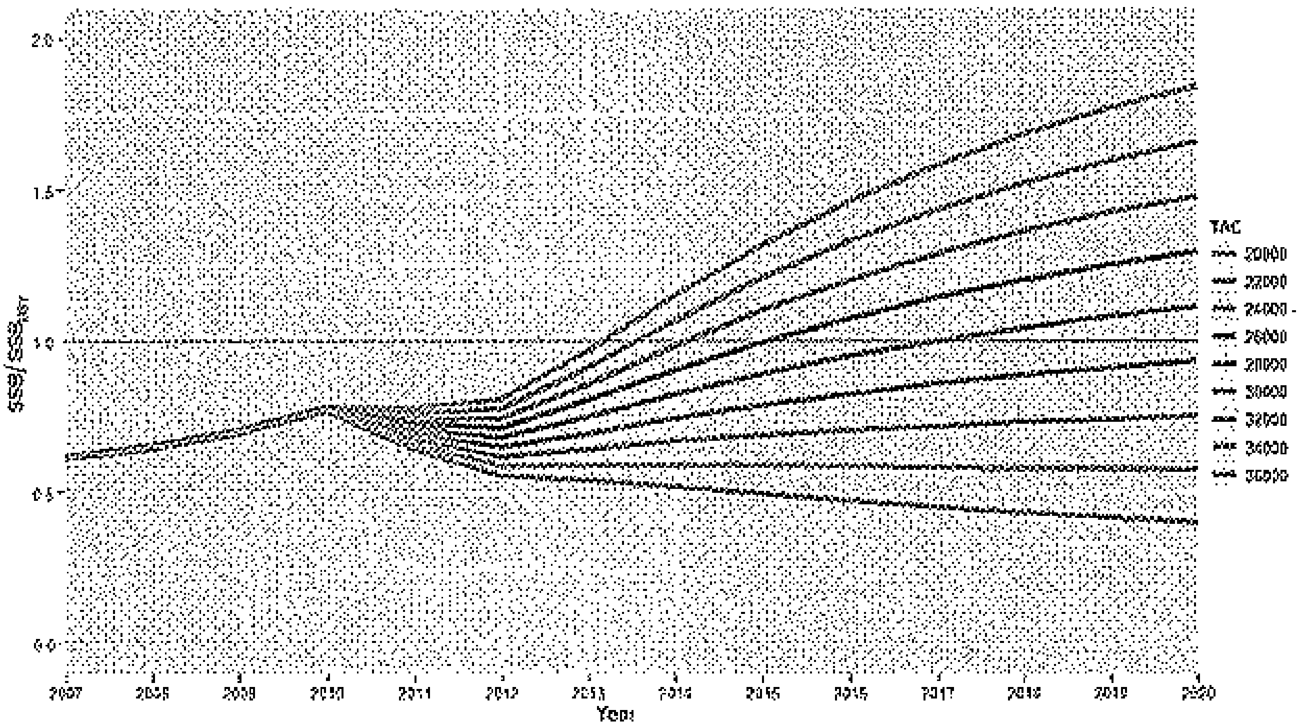
## ATLANTIC AND MEDITERRANEAN ALBACORE SUMMARY

| | North Atlantic | South Atlantic | Mediterranean |
|---|---|---|---|
| Current (2009) Yield | 15,364 t | 22,856 t | 4,021 t |
| Maximum Sustainable Yield | 29,000 t | 33,300 t (29,900-36,700) [1] | Unknown |
| Replacement Yield (2009) | Not estimated | 28,800 t (25,800-29,300) [1] | Not estimated |
| $SSB_{2007}/SSB_{MSY}$ [2] | 0.62 (0.45-0.79) [2] | | Not estimated |
| $SSB_{2005}/SSB_{MSY}$ [1] | | 0.91 (0.71-1.16) [1] | |
| Relative Fishing Mortality | | | |
| $F_{2007}/F_{MSY}$ [2] | 1.045 (0.85-1.23) [2] | | Not estimated |
| $F_{2005}/F_{MSY}$ [1] | | 0.63 (0.47-0.9) [1] | |
| Management measures in effect | [Rec. 98-08]: Limit No. of vessels to 1993-1995 average<br>TAC: 30,200 t [Rec. 07-02] for 2008 and 2009.<br>TAC: 28,000 t [Rec. 09-05] for 2010 and 2011. | [Rec. 07-03]: Limit catches to 29,900 t until 2011 | None |

[1] Reference points estimates based on 2007 assessment. Approximately 95% confidence bounds in the South stock.
[2] Reference points estimates based on 2009 assessment. 95% CI around the reference points were based on estimated 2007 standard errors in the North stock.




ALB-Figure 10. The distribution of stock status determination for South Atlantic albacore in 2005 indicating the uncertainty in this evaluation.




ALB-Figure 11. Estimated projections of relative SSB ($SSB/SSB_{MSY}$) for different scenarios of constant catch (20,000 t-36,000 t) assuming average recent year-class strengths for the North Atlantic albacore stock. Projections assumed a catch of 30,200 t in 2008 and 2009.

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*8.5 BFT – ATLANTIC BLUEFIN TUNA*

The SCRS conducted a comprehensive assessment of bluefin tuna in the Atlantic and the Mediterranean in 2010. In the assessment, the available data included catch, effort and size statistics through 2009. As previously discussed, there are considerable data limitations for the eastern stock up to 2007. While data reporting for the eastern and Mediterranean fisheries have substantially improved since 2008 and some historical statistical data have been recovered, none-the-less, most of the data limitations that have plagued previous assessments remain and will require new approaches in order to improve the scientific advice the Committee can offer.

The Enhanced Bluefin Tuna Research Program (GBYP) research plan outlined the research necessary for improving the scientific advice that the Committee provides to the Commission. This plan was presented to and approved by the Commission and the GBYP was started in 2010. The Committee continues to strongly and unanimously support the GBYP, and welcomes the Commission's continued commitment to the Program. In the absence of such a significant and sustained effort, it remains highly unlikely that the Committee will improve its scientific diagnosis and management advice in the foreseeable future.

*BFT-1. Biology*

Atlantic bluefin tuna (BFT) mainly live in the pelagic ecosystem of the entire North Atlantic and its adjacent seas, primarily the Mediterranean Sea. Bluefin tuna has a wide geographical distribution and is one of the only large pelagic fish living permanently in temperate Atlantic waters (BFT-Figure 1). Archival tagging and tracking information confirmed that bluefin tuna can sustain cold as well as warm temperatures while maintaining stable internal body temperature. Until recently, it was assumed that bluefin tuna preferentially occupies the surface and subsurface waters of the coastal and open-sea areas, but archival tagging and ultrasonic telemetry data indicate that bluefin tuna frequently dive to depths of 500m to 1,000m. Bluefin tuna is also a highly migratory species that seems to display a homing behavior and spawning site fidelity in both the Mediterranean Sea and Gulf of Mexico, which constitute the two main spawning areas being clearly identified today. Less is known about feeding migrations within the Mediterranean and the North Atlantic, but results from electronic tagging indicated that bluefin tuna movement patterns vary considerably between individuals, years and areas. The appearance and disappearance of important past fisheries further suggest that important changes in the spatial dynamics of bluefin tuna may also have resulted from interactions between biological factors, environmental variations and fishing. Although the Atlantic bluefin tuna population is managed as two stocks, conventionally separated by the 45°W meridian, its population structure remains poorly understood and needs to be further investigated. Recent genetic and microchemistry studies as well as work based on historical fisheries tend to indicate that the bluefin tuna population structure is complex.

Currently, bluefin tuna is assumed to mature at approximately 25 kg (age 4) in the Mediterranean and at approximately 145 kg (age 9) in the Gulf of Mexico. Juvenile and adult bluefin tuna are opportunistic feeders (as are most predators). However, in general, juveniles feed on crustaceans, fish and cephalopods, while adults primarily feed on fish such as herring, anchovy, sand lance, sardine, sprat, bluefish and mackerel. Juvenile growth is rapid for a teleost fish (about 30cm/year), but slower than other tuna and billfish species. Fish born in June attain a length of about 30-40cm long and a weight of about 1 kg by October. After one year, fish reach about 4 kg and 60cm long. Growth in length tends to be lower for adults than juveniles, but growth in weight increases. At 10 years old, a bluefin tuna is about 200 cm and 170 kg and reaches about 270 cm and 400 kg at 20 years. Bluefin tuna is a long lived species, with a lifespan of about 40 years, as indicated by recent studies from radiocarbon deposition.

The information on natal origin derived from otolith microchemistry received by the SCRS indicated that there is, based on samples covering a limited number of years, a greater contribution of eastern origin fish to the western fisheries with decreasing average size of the fish in the catch (i.e. up to 62% for fish in the 69-119 cm size class). In contrast, other western fisheries supported by the largest size classes had minimal or no eastern component in the catch. However, there remains considerable uncertainty and therefore additional samples are needed to improve our understanding of the relative contribution of the two stocks to the different fisheries over time. An issue that can hardly be resolved without better understanding of Atlantic bluefin tuna population structure.

In 2009, the SCRS received considerable new information on maturity, growth, and the spatial dynamics of Atlantic and Mediterranean bluefin (see SCRS/2009/192). Following key developments are summarized below.

The SCRS had extensive discussions concerning the choice of maturity schedules for both the eastern and western stocks. Uncertainty in age at maturity remained a significant issue for the stock assessment, and obliged the Group to consider alternative scenarios during their modeling work. Improving current understanding of the maturity schedules for bluefin tuna should be a priority area for research within the GBYP and other collaborative research programs with the SCRS.

The SCRS implemented a new growth curve for western stock that was derived from advanced analytical techniques. The adoption of the new growth curve that is nearly identical to that for the eastern stock has resulted in significant changes to some of the benchmark for the western stock and consequently management advice. For the Eastern Atlantic and Mediterranean stock, new information indicated that for farming operations, when applying the weight gain rates adopted by SCRS in 2009, the back calculated fish weights at initial capture seemed to show unrealistic size distributions, in that more fish of a smaller size are calculated as having been caught than would be expected given existing controls.

The SCRS also received several contributions related to electronic tagging within the Eastern Atlantic and Mediterranean stock. While most of the new studies are reporting work in progress, the new information appears to indicate a greater level of complexity in the migratory patterns of the eastern fish than was previously understood, as a significant fraction of the eastern fish (juveniles and spawners) seem to stay within the Mediterranean all year long.

*BFTE-2. Fishery Trends and Indicators – East Atlantic and Mediterranean*

It is very well known that introduction of fattening and farming activities into the Mediterranean in 1997 and good market conditions resulted in rapid changes in the Mediterranean fisheries for bluefin tuna mainly due to increasing purse seine catches. In the last few years, nearly all of the declared Mediterranean bluefin fishery production was exported overseas. Declared catches in the East Atlantic and Mediterranean reached a peak of over 50,000 t in 1996 and, then decreased substantially, stabilizing around TAC levels established by ICCAT for the most recent period (BFT-Table 1 and BFTE-Figure 1). Both the increase and the subsequent decrease in declared production occurred mainly for the Mediterranean (BFTE-Figure 1). For 2006 - 2009, declared catch was, at the time of the meeting, 30,689 t, 34,516 t, 24,057 t and 20,228 t for the East Atlantic and Mediterranean, of which 23,154 t, 26,479 t, 16,409 t and 13,527 t were declared for the Mediterranean for those same years (BFT-Table 1).

Information available has demonstrated that catches of bluefin tuna from the East Atlantic and Mediterranean were seriously under-reported between the mid-1990s through 2007. The Committee views this lack of compliance with TAC and underreporting of the catch as having undermined conservation of the stock. The Committee has estimated that realized catches during this period could have been on the order of 50,000 t to 61,000 t per year based on the number of vessels operating in the Mediterranean Sea and their respective catch rates. Estimates for 2008 and 2009 using updated vessel capacity and performance statistics from the various reports submitted to ICCAT under [Rec 08-05] results in estimates that are significantly lower than the corresponding reported Task I data (see BFT data prep. meeting). Although care is needed considering estimates of catch using these capacity measures, the Committee's interpretation is that a substantial decrease in the catch occurred in the Eastern Atlantic and Mediterranean Sea in 2008 and 2009.

Available indicators from small fish fisheries in the Bay of Biscay did not show any clear trend since the mid 1970s (Fig). This result is not particularly surprising because of strong inter-annual variation in year class strength. However, aerial survey results conducted in 2009 indicated a higher abundance or higher concentration of small bluefin in the northwestern Mediterranean than found in surveys conducted in 2000-2003. Indicators from Japanese longliners and Spanish and Moroccan traps targeting large fish (spawners) in the East Atlantic and the Mediterranean Sea displayed a recent increase after a general decline since the mid-1970s (BFTE-Figure 2). Indicators from longliners targeting medium to large fish in the northeast Atlantic were available since 1990 and showed an increasing trend in the recent years (BFTE Figure 2). This index becomes more valuable since the major part of Japanese catch come from this fishing ground in recent years, while the activities of longliners in the East Atlantic (south of 40N) and Mediterranean Sea were reduced. Two historical indicators before 1980 in the Bay of Biscay were also available. The Group recognized that the recent compliance to the regulatory measures affect significantly the CPUE values (e.g. Spanish baitboat and Japanese longline indices) through the change of operational pattern and target sizes. Recent tendency in indicators are likely to reflect positive outcomes from recent management measures. However, the Committee found it difficult to derive any clear conclusion from fisheries indicators over such a short period after the implementation of new regulations and in the absence of more precise information about the catch composition, effort and spatial distribution of the purse seine fisheries. Fisheries-independent indicators (scientific surveys) and a large scale tagging program are needed to provide more reliable stock status indicators. The Committee reaffirmed the importance of pursuing these research elements under the now-funded GBYP.

*BFTE-3. State of the stock*

In spite of improvements in the data quantity and quality for the past few years, there remain considerable data limitations for the 2010 assessment of the stock. These included poor temporal and spatial coverage for detailed size and catch-effort statistics for many fisheries, especially in the Mediterranean. Substantial under-reporting of total catches was also evident, especially during the 1998-2007 years. Nevertheless, the Committee assessed the stock in 2010 as requested by the Commission mainly applying the methodologies and hypotheses adopted by the Committee in previous assessments and further tried alternative approaches. The Committee believes that while substantial improvements can be made for in catch and effort statistics into the future, it appears unlikely that such substantial improvements can be made regarding historical fishery performance. Because of this, the Committee believes that assessment methodologies applied in the past must be modified to better accommodate the substantial uncertainties in the historical total catch, catch-at-age and effort data from the main fleets harvesting bluefin. This process has been initiated, but will require at least 3 years to complete in terms of robustness testing of the methodologies envisioned. The Commission should take this into account in establishing management controls. Furthermore, any change in exploitation or management will take several years to have a detectable effect on the biomass because bluefin tuna is a long lived species and our ability to quantify recent management impacts on stock status are limited due to variability in stock status indicators in the most recent years.

The assessment results upon which the Committee's main advice is provided indicated that the spawning stock biomass (SSB) had been mostly declining since the 1970s. The recent SSB tendency has shown signs of increase/stabilization in some runs while it continues to decline for others, depending on the models specifications and data used (see BFT detailed report, BFTE-Figure 3). Trend in fishing mortality (F) displayed a continuous increase over the time period for the younger ages (ages 2-5) while for oldest fish (ages 10+) it had been decreasing during the first 2 decades and then rapidly increased during the 1990s. Fishing mortalities have declined on the oldest fish in recent years, but these for younger (ages 2-5) are more uncertain and display higher variability (BFTE-Figure 3). General trends in F or N were not strongly affected by the historical catches assumptions (i.e. reported *versus* inflated), except in recent years. These analyses indicated that recent (2007-2009) SSB is about 57% of the highest estimated SSB levels (1957-1959). Recent recruitment levels remain very uncertain due to the lack of information about incoming year class strength and high variability in the indicators used to track recruitment and the low recent catches of fish less than the minimum size. The absolute values estimated for F and SSB remained sensitive to the assumptions of the analysis and could lead to a different perception in the whole trend in SSB. However, it is noteworthy that the historical Fs for older fish were consistent between different types of models which made use of different assumptions. For the 1995-2007 years, Fs for older fish are also consistent with a shift in targeting towards larger individuals destined for fattening and/or farming.

Estimates of current stock status relative to MSY benchmarks are uncertain, but lead to the conclusion that although the recent Fs have probably declined, these values remain too high and recent SSB too low to be consistent with the Convention Objectives. Depending on different assumed levels of resource productivity current F show signs of decline reflecting recent catch reductions, but remained larger than that which would result in MSY and SSB remained most likely to be about 35% (from 19% to 51% depending on the recruitment levels) than the level needed to support MSY (BFTE-Figure 4).

*BFTE-4. Outlook*

During the last decade, there has been an overall shift in targeting towards large bluefin tuna, mostly in the Mediterranean. As the majority of these fish are destined for fattening and/or farming operations, it is crucial to get precise information about the total catch, the size composition, the area and flag of capture. Progress has been made over the last years, but current information that consists in individual weight after fattening remain too uncertain to be used within stock assessment models. Therefore, real size samples at time of the catch are still required and the SCRS strongly encourages the use of dual camera system or other technology that could provide sizes of fish entering into cages.

The shift towards larger fish should result in improved yield-per-recruit levels in the long-term if $F$ were reduced to $F_{0.1}$. However, such changes would take several years to translate into gains in yield due to the longevity of the species. Realization of higher long-term yields would further depend on future recruitment levels.

Even considering uncertainties in the analyses, the outlook derived from the 2010 assessment has improved in comparison to previous assessments, as $F$ for older fish seem to have significantly declined during the last two years. However, estimates in the last years are known to be more uncertain and this decline (as the Fs for younger ages which remains more variable) needs to be confirmed in future analyses. Nonetheless, $F_{2009}$ still remains largely above the reference target $F_{0.1}$ (a reference point more robust to uncertainties than $F_{MAX}$ as used in the past) while SSB is only about 35% of the biomass that is expected under a MSY strategy (BFTE-Figure 4).

The Committee also evaluated the potential effects of [Rec. 09-06]. Acknowledging that there is insufficient scientific information to determine precisely the productivity of the stock (i.e. the steepness of the stock-recruitment relationship), the Committee agreed to perform the projections with three recruitment levels while taking into account for year-to-year variations. These levels correspond to the 'low' and 'high' scenarios as defined in the 2008 assessment plus a 'Medium' scenario that corresponds to the geometric mean of the recruitment over the 1950-2006 years. For the projections, the group investigated 24 scenarios (see BFT detailed report). The results indicated that the stock is increasing in all the cases, but the probability to achieve $SSB_{F0.1}$ (i.e. the equilibrium SSB resulting in fishing at $F_{0.1}$) by the end of 2022 depend on the scenarios (run 13 leads to slower rebuilding than run 15 while the recruitment levels affect both the speed of rebuilding and the level of depletion, see BFT detailed report). Overall, the SSB would be equal or greater than $SSB_{F0.1}$ by the end of 2022 for a catch = 0 to 13,500 t, but not when the catch is greater than 14,000 t (**BFTE-Table 2, BFTE-Figure 5**). It is finally worth noting that a $F_{0.1}$ strategy <u>starting in 2011</u> would not allow the rebuilding of the stock to $SSB_{F0.1}$ by 2022, but later on.

Projections are known to be impaired by various sources of uncertainties that have not yet been quantified. Although the situation has improved regarding recent catch, there are still uncertainties about stock status in 2009, population structure and migratory rates as well as a lack of knowledge about the level of IUU catch and key modeling parameters on BFT productivity. Acknowledging these limitations, the overall evaluation of [Rec. 09-06] indicated that the rebuilding of BFTE at $SSB_{F0.1}$ level with a probability of at least 60% could be achieved by 2019 with zero catch and by 2022 with catch equal to current TAC (i.e. 13500 t). However, this 60% probability level is unlikely to be attained by the end of 2022 with a catch greater than 14,000 t. Finally, it should be noted that the incorporation of additional uncertainties into the overall analysis could change the estimates of rebuilding probability.

*BFTE-5. Effect of current regulations*

Catch limits have been in place for the eastern Atlantic and Mediterranean management unit since 1998. In 2002, the Commission fixed the Total Allowable Catch (TAC) for the East Atlantic and Mediterranean bluefin tuna at 32,000 t for the years 2003 to 2006 [Rec. 02-08] and at 29,500 t and 28,500 t for 2007 and 2008, respectively [Rec. 06-05]. Subsequently, [Rec. 08-05] established TACs for 2009, 2010, and 2011 at 22,000 t, 19,950 t, and 18,500 t, respectively. However, the 2010 TAC was revised to 13,500 t by [Rec. 09-06] which also established a framework to set future (2011 and beyond) TAC at levels sufficient to rebuild the stock to $B_{MSY}$ by 2022 with at least 60% probability.

The reported catches for 2003, 2004 and 2006 were about TAC levels, but those for 2005 (35,845 t) and 2007 (34,516 t) were notably higher than TAC. However, the Committee strongly believes, based on the knowledge of the fisheries and trade statistics, that substantial under-reporting was occurring and that actual catches up to 2007 were well above TAC. The SCRS estimates since the late-1990s, catches were close to the levels reported in the mid-1990s, but for 2007, the estimates were higher *i.e.* about 61,000 t in 2007 for both the East Atlantic and Mediterranean Sea. As noted, reported catch levels for 2008 (24,057 t) and 2009 (20,228 t) appear to largely reflect the removals from the stock when comparing estimates of catch using vessel capacity measures, although the utility of this method has diminished for estimating catch. The reported catches for 2008 and 2009 are 10,000 t to 15,000 t lower than the 2003-2007 reported catches (**BFTE-Table 1, BFTE-Figure 1**). Although care is needed considering estimates of catch using capacity measures, the Committee's interpretation is that a substantial decrease in the catch occurred in the Eastern Atlantic and Mediterranean Sea through implementation of the rebuilding plan and through monitoring and enforcement controls. While current controls appear sufficient to constrain the fleet to harvests at or below TAC, should it not be the case, the Committee remains concerned about substantial excess capacity remains which could harvest catch volumes well in excess of the rebuilding strategy adopted by the Commission.

Recent analyses from the reported Catch-at-size and Catch-at-age displayed important changes in selectivity patterns over the last three years for several fleets operating in the Mediterranean Sea or the East Atlantic. This partly results from the enforcement of minimum size regulations under Rec.[06.05] which led to much lower reported catch of younger fish and subsequently a steep increase in the annual mean-weight in the catch-at-size since 2007 (**BFTE-Figure 5**) Additionally, higher abundance or higher concentration of small BFT in the Northwestern Mediterranean detected from aerial surveys could also reflect positive outcomes from increase minimum size regulation.

While several fishery indicators have shown some positive tendency in the most recent fishing seasons, the available catch effort statistics are not yet sufficient to permit the Committee to quantify the extent of impact of the recent regulations on the overall stock with precision. The Committee's view is that it will take additional years under constrained fishing before to measure it more precisely.

*BFTE-6. Management Recommendations*

In [Rec. 09-06] the Commission established a total allowable catch for eastern Atlantic and Mediterranean bluefin tuna at 13,500 t in 2010. Additionally, in [Rec. 09-06] the Commission required that the SCRS provide the scientific basis for the Commission to establish a three-year recovery plan for 2011-2013 with the goal of achieving BMSY through 2022 with at least 60% of probability.

A Kobe II strategy matrix reflecting recovery scenarios of eastern Atlantic and Mediterranean bluefin tuna in accordance with the multiannual recovery plan is given in **BFTE-Table 1** and **BFTE-Figure 6**.

The implementation of recent regulations through [Rec. 09-06, and previous recommendations] has clearly resulted in reductions in catch and fishing mortality rates. But, since the fishery is currently adapting to these new management measures, the Committee is unable to fully understand the implications of the measures on the stock. The Commission might consider a probability of rebuilding standard different from that envisaged in [Rec. 09-06] considering the unquantified uncertainties. However, the Committee notes that maintaining catches at the current TAC (13,500 mt) under the current management scheme, for 2011-2013, will likely allow the stock to increase during that period and is consistent with the goal of achieving $F_{MSY}$ and $B_{MSY}$ through 2022 with at least 60% of probability, given the quantified uncertainties.

| EAST ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA SUMMARY | | |
|---|---|---|
| Current (2009) Yield[1] | Reported: 19,701t | SCRS estimate: 18,308 t |
| Short-term Sustainable Yield according to Rec.[09.06] | 13,500 t or less | |
| Long-term potential yield [2] | about 50,000 t | |
| $SSB_{2009}/SSB_{F0.1}$ ($SSB_{2009}$/ $SSB_{FMAX}$)[3] | | |
| Medium recruitment (1950-2006) | 0.35 (0.62) | |
| Low recruitment (1970s) | 0.51 (0.88) | |
| High recruitment (1990s) | 0.19 (0.33) | |
| $F_{2009}/F_{0.1}$ ($F_{2009}$/ $F_{MAX}$)[4] | | |
| Reported and Inflated catches | 2.9 (1.53) | |
| TAC (2009 - 2010) | 19,950 t - 13,500 t | |

[1] Corresponds to the reported catches on the October 07, 2010. SCRS estimate is based on updated vessel capacity and vessel catch rates information (see BFT data prep. Report). Note that the 2009 Yield estimate used in the 2010 stock assessment was 20,228 t due to estimations of missing reports at the date of the meeting (see BFT-Table 1).

[2] Approximated as the average of long-term yield at $F_{0.1}$ that was calculated over a broad range of scenarios including contrasting recruitment levels and different selectivity patterns (estimates from these scenarios ranged between 29,000 t and 91,000 t).

[3] The Committee decided, on the basis of current published literature, to adopt $F_{0.1}$ as the proxy for $F_{MSY}$ instead of $F_{MAX}$. $F_{0.1}$ has been indeed shown to be more robust to observation errors and uncertainty about the true dynamics of the stock than $F_{MAX}$. However, references to $F_{MAX}$ are also given in parentheses for comparison purposes.

[...]

[4] The recruitment levels do not impact $F_{2009}/F_{0.1}$ or $F_{2009}/F_{MAX}$.

BFT-Table 1. Estimated Catches (t) of Northern bluefin tuna (*Thunnus thynnus*) by area, gear and flag, used in the assessment (2008 and 2009 catches in italic are estimations adopted by the WG).
BFT-Tableau 1. Prises estimées (t) de thon rouge du Nord (*Thunnus thynnus*) par zone, engin et pavillon, utilisées dans l'évaluation (les prises de 2008 et 2009 en italiques sont des estimations adoptées par le Groupe de travail).
BFT-Tabla 1. Capturas estimadas (t) de atún rojo (*Thunnus thynnus*) por área, arte y bandera utilizadas en la evaluación (las capturas de 2008 y 2009 en cursiva son estimaciones adoptadas por el Grupo de trabajo).

| | | | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | *2008 | *2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL | | | 24695 | 21570 | 28023 | 27016 | 25815 | 26027 | 29050 | 34131 | 36426 | 40853 | 49714 | 53250 | 49459 | 47375 | 35724 | 36544 | 37296 | 37089 | 33469 | 33505 | 37602 | 32561 | 36154 | *26054* | *22163* | 25549 | 21636 |
| ATE+MED | | | 22010 | 19287 | 18220 | 24118 | 23061 | 23247 | 26429 | 31849 | 34366 | 40740 | 47291 | 50897 | 47135 | 39718 | 32456 | 33766 | 34665 | 33770 | 31163 | 31341 | 35865 | 30689 | 34516 | *24464* | *20228* | 23849 | 19701 |
| ATE | | | 4807 | 4687 | 4456 | 6951 | 5433 | 6640 | 6356 | 7619 | 7167 | 6930 | 9650 | 12463 | 13539 | 11576 | 9628 | 10528 | 10086 | 10347 | 7362 | 7410 | 9006 | 9535 | 8037 | *7643* | *6701* | 7645 | 6684 |
| MED | | | 17203 | 14560 | 13764 | 17167 | 15628 | 17907 | 19872 | 24230 | 24904 | 30810 | 37640 | 38144 | 33616 | 28142 | 22828 | 23238 | 24519 | 23421 | 23801 | 23671 | 26810 | 21154 | 26479 | *16409* | *13527* | 16185 | 13016 |
| ATW | | | 2685 | 2252 | 2563 | 2893 | 2759 | 2789 | 2921 | 2262 | 2186 | 2113 | 2423 | 2354 | 2324 | 2657 | 2772 | 2775 | 2784 | 3319 | 2306 | 2125 | 1756 | 1811 | 1638 | 2000 | 1934 | 2000 | 1936 |
| Landings | ATE | Bait boat | 2324 | 1414 | 1831 | 1936 | 1971 | 1690 | 1445 | 1161 | 3447 | 1586 | 2600 | 4985 | 3521 | 2353 | 1693 | 1822 | 2275 | 2357 | 1371 | 1750 | 2018 | 1116 | 2003 | *1794* | *1260* | 1794 | 1260 |
| | | Longline | 551 | 957 | 924 | 1169 | 962 | 1456 | 3197 | 3417 | 2317 | 2176 | 4392 | 4768 | 4534 | 4303 | 4020 | 3736 | 3303 | 2696 | 2750 | 2014 | 2763 | 2648 | 1706 | 2491 | *1955* | 2491 | 1966 |
| | | Other surf. | 536 | 972 | 658 | 1221 | 1020 | 562 | 347 | 234 | 1545 | 932 | 1047 | 646 | 511 | 621 | 458 | 703 | 712 | 701 | 560 | 402 | 1054 | 1042 | 502 | 437 | *366* | 187 | 298 |
| | | Purse seine | 66 | 275 | 0 | 0 | 6 | 54 | 46 | 463 | 24 | 233 | 455 | 323 | 928 | 692 | 726 | 1147 | 156 | 684 | 490 | 1672 | 571 | 332 | 0 | 0 | 0 | 0 | 0 |
| | | Sport (HL+RR) | 1 | 1 | 3 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 162 | 58 | 33 | 155 | 61 | 63 | 109 | 37 | 11 | 4 | 10 | 6 | 2 | 6 | 2 |
| | | Traps | 1630 | 1037 | 1040 | 2624 | 1478 | 2234 | 1503 | 1365 | 1631 | 1630 | 1153 | 1921 | 3982 | 3185 | 2959 | 2996 | 3555 | 3233 | 2082 | 1573 | 2405 | 2532 | 2758 | 3166 | *3174* | 3166 | 3154 |
| | MED | Bait boat | 374 | 0 | 0 | 0 | 0 | 25 | 143 | 158 | 45 | 0 | 266 | 5 | 4 | 13 | 4 | 0 | 0 | 1 | 5 | 17 | 5 | 0 | 0 | 0 | 0 | 0 | |
| | | Longline | 1328 | 678 | 799 | 1322 | 1121 | 1026 | 2169 | 2599 | 2342 | 3218 | 6475 | 8575 | 5672 | 2749 | 2443 | 3317 | 3750 | 2484 | 2476 | 2564 | 3101 | 2202 | 2656 | *2347* | *1717* | 2254 | 1213 |
| | | Other surf. | 3231 | 3544 | 2763 | 2870 | 3289 | 3212 | 1452 | 1894 | 1607 | 3218 | 1043 | 1199 | 1037 | 1590 | 2976 | 4067 | 4094 | 500 | 2538 | 3306 | 450 | 381 | 699 | 1002 | *2566* | 1002 | 169 |
| | | Purse seine | 11219 | 9533 | 8357 | 11152 | 9450 | 13250 | 14245 | 17897 | 19297 | 26052 | 25608 | 26021 | 24178 | 21291 | 14910 | 16195 | 17174 | 17656 | 17167 | 15783 | 22475 | 20000 | 22952 | *12834* | *9166* | 12641 | 11343 |
| | | Sport (HL+RR) | 507 | 321 | 433 | 838 | 437 | 1552 | 738 | 951 | 1237 | 2257 | 3556 | 2149 | 2540 | 1836 | 1622 | 1931 | 1331 | 1647 | 1392 | 1346 | 636 | 503 | 78 | *128* | *119* | 137 | 146 |
| | | Traps | 760 | 683 | 917 | 1034 | 1311 | 2152 | 1471 | 521 | 570 | 1204 | 222 | 601 | 185 | 1074 | 832 | 739 | 1177 | 515 | 221 | 155 | 115 | 129 | 95 | 152 | 144 | 152 | 144 |
| | ATW | Longline | 1245 | 764 | 1138 | 1373 | 1095 | 735 | 895 | 674 | 656 | 530 | 466 | 547 | 382 | 781 | 914 | 853 | 610 | 725 | 186 | 644 | 425 | 565 | 438 | 606 | *362* | 606 | 360 |
| | | Other surf. | 293 | 166 | 156 | 425 | 745 | 536 | 574 | 509 | 406 | 397 | 364 | 432 | 293 | 342 | 251 | 284 | 260 | 103 | 140 | 97 | 99 | 55 | 63 | 12 | *272* | 32 | 121 |
| | | Purse seine | 377 | 360 | 363 | 363 | 345 | 344 | 237 | 300 | 295 | 301 | 249 | 245 | 250 | 249 | 248 | 275 | 196 | 258 | 265 | 32 | 176 | 4 | 26 | 0 | 11 | 0 | 11 |
| | | Sport (HL+RR) | 750 | 518 | 726 | 601 | 782 | 1004 | 1083 | 380 | 852 | 804 | 1114 | 1029 | 1183 | 1108 | 1126 | 1126 | 1649 | 2035 | 1398 | 1139 | 924 | 1005 | 1023 | 1130 | 1251 | 1130 | 1251 |
| | | Traps | 20 | 0 | 17 | 14 | 1 | 2 | 0 | 1 | 29 | 79 | 72 | 59 | 55 | 68 | 44 | 16 | 16 | 28 | 24 | 33 | 8 | 7 | 4 | 25 | 23 | 25 | 23 |
| Discards | ATW | Longline | 0 | 524 | 99 | 102 | 119 | 115 | 123 | 211 | 87 | 87 | 138 | 167 | 155 | 123 | 160 | 232 | 185 | 211 | 232 | 181 | 131 | 149 | 180 | 155 | 143 | 159 | 163 |
| | | Other surf. | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| | | Sport (HL+RR) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 3 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Landings | ATE | Cape Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| | | China P.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 85 | 103 | 80 | 68 | 39 | 19 | 41 | 24 | 42 | 32 | 115 | 42 | 119 | 42 |
| | | Chinese Taipei | 16 | 197 | 30 | 0 | 109 | 0 | 0 | 0 | 6 | 20 | 8 | 61 | 226 | 350 | 222 | 144 | 304 | 155 | 2 | 0 | 10 | 4 | 0 | 0 | 0 | 0 | |
| | | EU.Denmark | 37 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.España | 3624 | 2674 | 2479 | 4567 | 3565 | 3557 | 2272 | 2319 | 5074 | 3137 | 3819 | 6174 | 6201 | 3800 | 3360 | 3474 | 3537 | 4089 | 2126 | 2950 | 3102 | 2033 | 3276 | 2014 | 2409 | 2032 | 2400 |
| | | EU.France | 490 | 245 | 533 | 724 | 460 | 510 | 565 | 294 | 1095 | 336 | 725 | 563 | 269 | 615 | 558 | 547 | 629 | 755 | 646 | 561 | 818 | 1281 | 629 | 251 | 366 | 253 | 366 |
| | | EU.Germany | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| | | EU.Greece | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| | | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 21 | 55 | 22 | 8 | 15 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| | | EU.Poland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| | | EU.Portugal | 29 | 192 | 163 | 65 | 3 | 27 | 112 | 31 | 75 | 240 | 33 | 192 | 712 | 713 | 431 | 441 | 404 | 186 | 61 | 27 | 79 | 97 | 29 | 36 | 60 | 36 | 53 |
| | | EU.Sweden | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 1 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 1 |
| | | Faroe Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 67 | 104 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Guinée Conakry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 330 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Iceland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 27 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Japan | 439 | 739 | 903 | 1169 | 838 | 1454 | 2025 | 2356 | 2464 | 2075 | 3971 | 3341 | 2905 | 3195 | 2690 | 2895 | 3425 | 2536 | 2695 | 3015 | 2575 | 1696 | 1657 | 2351 | 1904 | 2351 | 1904 |
| | | Korea Rep. | 77 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 205 | 92 | 203 | 0 | 6 | 6 | 1 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | |
| | | Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 312 | 0 | 0 | 0 | 575 | 477 | 513 | 450 | 457 | 0 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 0 | 0 | |
| | | Maroc | 86 | 288 | 356 | 437 | 451 | 408 | 531 | 562 | 465 | 722 | 678 | 1015 | 2068 | 2345 | 1591 | 2228 | 2497 | 3563 | 1777 | 1961 | 2429 | 2196 | 2415 | 1947 | 1909 | 1947 | 1909 |
| | | NEI (ETRO) | 3 | 4 | 0 | 5 | 6 | 74 | 4 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | NEI (Flag related) | 0 | 0 | 0 | 0 | 0 | 0 | 55 | 344 | 223 | 65 | 189 | 71 | 205 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Norway | 0 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Panama | 22 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 75 | 150 | 255 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Sierra Leone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 93 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| | MED | Albania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *50* | 0 | |
| | | Algeria | 260 | 566 | 420 | 677 | 820 | 782 | 800 | 1104 | 1097 | 1560 | 156 | 156 | 197 | 1947 | 2142 | 2330 | 2012 | 1710 | 1586 | 1208 | 1530 | 1038 | 1511 | 1511 | *242* | 1311 | |
| | | China P.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 97 | 137 | 93 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Chinese Taipei | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 322 | 709 | 494 | 411 | 278 | 106 | 27 | 165 | 329 | 508 | 445 | 31 | 267 | 5 | 0 | 0 | 0 | 0 | |
| | | Croatia | 0 | 0 | 0 | 0 | 0 | 0 | 1418 | 1076 | 1058 | 1410 | 1220 | 1360 | 1105 | 906 | 970 | 930 | 500 | 977 | 1139 | 828 | 1017 | 1022 | 825 | 927 | *747* | 836 | 639 |

BFTE-Table 1. Probabilities of stock rebuilding at $SSB_{F0.1}$ by years and TAC levels (the probabilities combined the results obtained from the stochastic runs over the 24 scenarios being investigated). The difference in grey colour underlines the catch (TAC) at which the 60% probability would not be anymore achieved.

| TAC | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0% | 0% | 0% | 2% | 6% | 14% | 25% | 38% | 52% | 69% | 89% | 98% | 99% |
| 2000 | 0% | 0% | 0% | 1% | 5% | 12% | 21% | 33% | 46% | 62% | 83% | 97% | 99% |
| 4000 | 0% | 0% | 0% | 1% | 4% | 9% | 16% | 28% | 40% | 55% | 75% | 93% | 99% |
| 6000 | 0% | 0% | 0% | 1% | 3% | 7% | 14% | 23% | 34% | 47% | 66% | 86% | 97% |
| 8000 | 0% | 0% | 0% | 0% | 2% | 6% | 11% | 19% | 29% | 40% | 56% | 77% | 92% |
| 10000 | 0% | 0% | 0% | 0% | 2% | 4% | 9% | 15% | 23% | 33% | 46% | 65% | 84% |
| 12000 | 0% | 0% | 0% | 0% | 1% | 3% | 6% | 11% | 18% | 26% | 37% | 53% | 73% |
| 13500 | 0% | 0% | 0% | 0% | 1% | 2% | 5% | 9% | 14% | 21% | 30% | 45% | 63% |
| 14000 | 0% | 0% | 0% | 0% | 1% | 2% | 4% | 8% | 13% | 20% | 28% | 42% | 58% |
| 16000 | 0% | 0% | 0% | 0% | 0% | 1% | 3% | 6% | 9% | 14% | 20% | 31% | 46% |
| 18000 | 0% | 0% | 0% | 0% | 0% | 1% | 2% | 4% | 6% | 10% | 15% | 22% | 34% |
| 20000 | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 2% | 4% | 6% | 10% | 15% | 24% |

Original: English

*BLUEFIN TUNA - WEST*

*BFTW-2. Fishery indicators*

The total catch for the West Atlantic peaked at 18,671 t in 1964, mostly due to the Japanese longline fishery for large fish off Brazil and the United States purse seine fishery for juvenile fish (**BFT-Table 1, BFTW-Figure1**). Catches dropped sharply thereafter with the collapse of the bluefin tuna by-catch longline fishery off Brazil in 1967 and decline in purse seine catches, but increased again to average over 5,000 t in the 1970s due to the expansion of the Japanese longline fleet into the northwest Atlantic and Gulf of Mexico and an increase in purse seine effort targeting larger fish for the sashimi market. The total catch for the West Atlantic including discards has generally been relatively stable since 1982 due to the imposition of quotas. However, since a total catch level of 3,319 t in 2002(the highest since 1981, with all three major fishing nations indicating higher catches), total catch in the West Atlantic declined steadily to a low of 1,638 t in 2007 and then increased in 2008 to 2,000 t. and slightly decreased in 2009 to 1,935 t (**BFTW-Figure 1**). The decline through 2007 was primarily due to considerable reductions in catch levels for United States fisheries. Since 2002, the Canadian annual catches have been relatively stable at about 500-600 t (733 t in 2006); the 2006 catch was the highest recorded since 1977. The 2009 Canadian catch was 530 t. Japanese catches have generally fluctuated between 300-500 t, with the exception of 2003 (57 t), which was low for regulatory reasons. However, Japanese landings for 2009 corresponded to only 162 t.

The average weight of BFT taken by the combined fisheries in the West Atlantic were historically low during the 1960s and 1970s (**BFTW-Figure 2**), for instance showing an average weight of only 33 kg during the 1965-1975 period. However, since 1980 they have been showing a quite stable trend and at a quite high average weight of 93 kg.

The overall number of Japanese vessels engaged in bluefin fishing has declined from more than 100 vessels to currently less than 10 vessels in the West Atlantic. After reaching 2,014 t in 2002 (the highest level since 1979), the catches (landings and discards) of U.S. vessels fishing in the northwest Atlantic (including the Gulf of Mexico) declined precipitously during 2003-2007. The United States did not catch its quota in 2004-2008 with catches of 1,066, 848, 615, 858 and 922 t, respectively. However, in 2009 the United States fully realized its base quota with total catches (landings including dead discards) of 1,228 t.

The indices of abundance used in this year's assessment were updated through 2009 (**BFTW-Figure 3**). The catch rates of juvenile bluefin tuna in the U.S. rod and reel fishery fluctuate with little apparent long-term trend, but exhibit a pattern that is consistent with the strong year-class estimated for 2003. The catch rates of adults in the U.S. rod and reel fishery continue to remain low, increasing only slightly in 2008 and decreasing once again in 2009. The catch rates of the Japanese longline fishery increased markedly in 2007, decreased in 2008 back to the levels observed in 2005 and 2006 and it increased once again in 2009. The catch rates from the U.S. Gulf of Mexico longline fishery continue to show a gradual increasing trend, whereas the Gulf of Mexico larval survey continues to fluctuate around the low levels observed since the 1980s. The catch rates in the Gulf of St. Lawrence have increased rapidly since 2004 and the catch rates in is the highest in the time series. The catch rates in southwest Nova Scotia have continued to follow a slightly increasing trend since 2000, with catch rates in 2009 being amongst the highest since the early 1990s.

*BFTW-3. State of the stock*

A new assessment was conducted this year, including information through 2009. The most influential change since the 2008 assessment was the use of a new growth curve that assigns fish above 120 cm to older ages than did the previous growth curve. As a result, the base model estimates lower fishing mortality rates and higher biomasses for spawners, but also less potential in terms of the maximum sustainable yield. The trends estimated during the 2010 assessment are consistent with previous analyses in that spawning stock biomass (SSB) declined steadily from 1970 to 1992 and has since fluctuated between 21% and 29% of the 1970 level (**BFTW-Figure 4**). In recent years, however, there appears to have been a gradual increase in SSB from the low of 21% in 2003 to an estimated 29% in 2009. The stock has experienced different levels of fishing mortality (F) over time, depending on the size of fish targeted by various fleets (**BFTW-Figure 4**). Fishing mortality on spawners (ages 9 and older) declined markedly after 2003.

Estimates of recruitment were very high in the early 1970s (**BFTW-Figure 4**), and additional analyses involving longer catch and index series suggest that recruitment was also high during the 1960s. Since 1977, recruitment has varied from year to year without trend with the exception of a strong year-class in 2003. The 2003 year-class is estimated to be the largest since 1974, but not quite as large as those prior to 1974. The 2003 year class is expected to begin to contribute to an increase in spawning biomass after several years. The Committee expressed concern that the year-class estimates subsequent to 2003, while less reliable, are the lowest on record.

A key factor in estimating MSY-related benchmarks is the highest level of recruitment that can be achieved in the long term. Assuming that average recruitment cannot reach the high levels from the early 1970s, recent F (2006-2008) is 70% of the MSY level and $SSB_{2009}$ is about 10% higher than the MSY level (**BFTW-Figure 5**). Estimates of stock status are more pessimistic if a high recruitment scenario is considered ($F/F_{MSY}$=1.9, $B/B_{MSY}$=0.15).

One important factor in the recent decline of fishing mortality on large bluefin is that the TAC had not been taken during this time period until 2009, due primarily to a shortfall by the United States fisheries (until 2009). Two plausible explanations for the shortfall were put forward previously by the Committee: (1) that availability of fish to the United States fishery has been abnormally low, and/or (2) the overall size of the population in the Western Atlantic declined substantially from the level of recent years. While there is no overwhelming evidence to favor either explanation over the other, the base case assessment implicitly favors the first hypothesis (regional changes in availability) by virtue of the estimated increase in SSB. The decrease indicated by the U.S. catch rate of large fish is matched by an increase in several other large fish indices (**BFTW-Figure 3**). Nevertheless, the Committee notes that there remains substantial uncertainty on this issue and more research needs to be done.

The SCRS cautions that the conclusions of this assessment do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Limited analyses were conducted of the two stocks with mixing in 2008, but little new information was available in 2010. Based on earlier work, the estimates of stock status can be expected to vary considerably depending on the type of data used to estimate mixing (conventional tagging or isotope signature samples) and modeling assumptions made. More research needs to be done before mixing models can be used operationally for management advice. Another important source of uncertainty is recruitment, both in terms of recent levels (which are estimated with low precision in the assessment), and potential future levels (the "low" vs "high" recruitment hypotheses which affect management benchmarks). Improved knowledge of maturity at age will also affect the perception of changes in stock size. Finally, the lack of representative samples of otoliths requires determining the catch at age from length samples, which is imprecise for larger bluefin tuna.

*BFTW-4. Outlook*

A medium-term (10-year) outlook evaluation of changes in spawning stock size and yield over the remaining rebuilding period under various management options was conducted. Future recruitment was assumed to fluctuate around two alternative scenarios: (i) average levels observed for 1976-2006 (85,000 recruits, the low recruitment scenario) and (ii) levels that increase as the stock rebuilds (MSY level of 270,000 recruits, the high recruitment scenario). The Committee has no strong evidence to favor either scenario over the other and notes that both are reasonable (but not extreme) lower and upper bounds on rebuilding potential.

The outlook for bluefin tuna in the West Atlantic with the low recruitment scenario (**BFTW-Figure 6**) is more optimistic with respect to current stock status than that from the 2008 assessment (owing to the use of improved information on the growth of bluefin tuna). A total catch of 2,500 t is predicted to have at least a 50% chance of achieving the convention objectives of preventing overfishing and maintaining the stock above the MSY level. The outlook under the high recruitment scenario (**BFTW-Figure 6**) is more pessimistic than the low recruitment scenario since the rebuilding target would be higher; a total catch of less than 1,250 t is predicted to maintain F below $F_{MSY}$, but the stock would not be expected to rebuild by 2019 even with no fishing.

**BFTW-Table 1** summarizes the estimated chance that various constant catch policies will allow rebuilding under the high and low recruitment scenarios for the base-case. The low recruitment scenario suggests the stock is above the MSY level with greater than 60% probability and catches of 2,500 t or lower will maintain it above the MSY level. If the high recruitment scenario is correct, then the western stock will not rebuild by 2019 even with no catch, although catches of 1,100 t or less are predicted to have a 60% chance to immediately end overfishing and initiate rebuilding.

The Committee notes that considerable uncertainties remain for the outlook of the western stock, including the effects of mixing and management measures on the eastern stock

*BFTW-5. Effects of current regulations*

The Committee previously noted that Recommendation 06-06 was expected to result in a rebuilding of the stock towards the convention objective, but also noted that there has not yet been enough time to detect with confidence the population response to the measure. This statement is also true for Recommendation 08-04, which was implemented in 2009. Some of the available fishery indicators (**BFTW-Figure 3**) as well as the current assessment suggest the spawning biomass of western bluefin tuna may be slowly rebuilding.

*BFTW-6. Management recommendations*

In 1998, the Commission initiated a 20-year rebuilding plan designed to achieve $B_{MSY}$ with at least 50% probability. In response to recent assessments, in 2008 the Commission recommended a total allowable catch (TAC) of 1,900 t in 2009 and 1,800 t in 2010 [Rec. 08-04].

The current (2010) assessment indicates similar historical trends in abundance as in previous assessments. The strong 2003 year class has contributed to stock productivity such that biomass has been increasing in recent years.

Future stock productivity, as with prior assessments, is based upon two hypotheses about future recruitment: a 'high recruitment scenario" in which future recruitment has the potential to achieve levels that occurred in the early 1970's and a "low recruitment scenario" in which future recruitment is expected to remain near present levels. Results in previous assessments have shown that long term implications of future biomass are different between the two hypotheses and this research question remains unresolved. However, the current (2010) assessment is also based on new information on western bluefin growth rates that has modified the Committee's perception of the ages at which spawning and maturity occur. Maturity schedules remain very uncertain, and, thus, the application of the new information in the current (2010) assessment accentuates the differences between the two recruitment hypotheses.

Probabilities of achieving $B_{MSY}$ within the Commission rebuilding period were projected for alternative catch levels (**BFTW-Table 1, BFTW-Figure 7**). The "low recruitment scenario" suggests that biomass is currently sufficient to produce MSY, whereas the "high recruitment scenario" suggests that $B_{MSY}$ has a very low probability of being achieved within the rebuilding period. Despite this large uncertainty about the long term future productivity of the stock, under either recruitment scenario current catches (1,800 t) should allow the biomass to continue to increase. Also, catches in excess of 2,500 t will prevent the possibility of the 2003 year class elevating the productivity potential of the stock in the future.

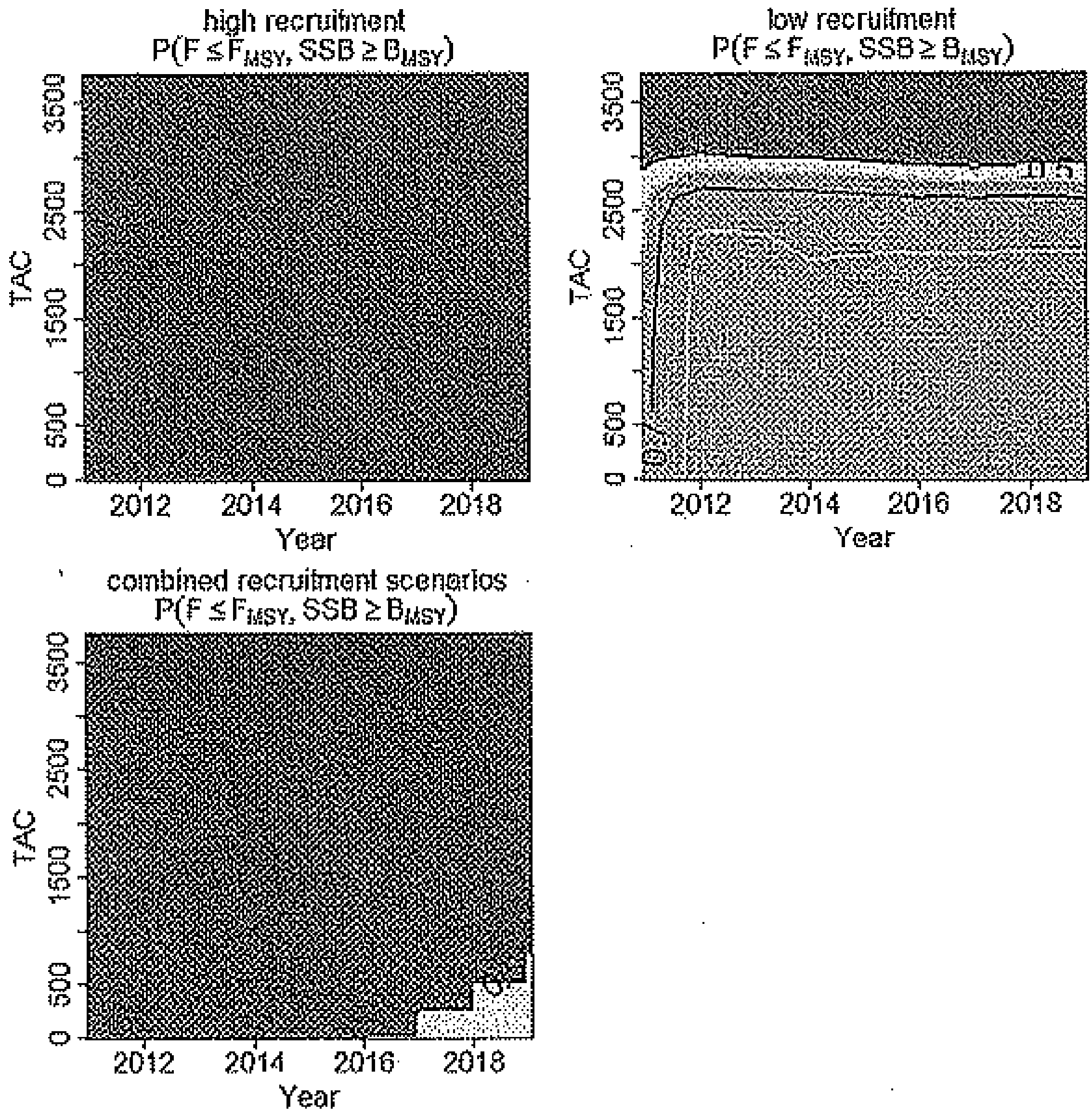
The SCRS notes that the 2010 assessment is the first time that this strong 2003 year-class has been clearly demonstrated, likely as a result of age assignment refinements resulting from the growth curve and additional years of data; more observations from the fishery are required to confirm its relative strength. A further concern is that subsequent year-classes, although even less well estimated, are the lowest observed values in the time series. The Commission may wish to protect the 2003 year class until it reaches maturity and can contribute to spawning. Maintaining catch at current levels (1,800 t) may offer some protection.

As noted previously by the Committee, both the productivity of western Atlantic bluefin and western Atlantic bluefin fisheries are linked to the eastern Atlantic and Mediterranean stock. Therefore, management actions taken in the eastern Atlantic and Mediterranean are likely to influence the recovery in the western Atlantic, because even small rates of mixing from East to West can have significant effects on the West due to the fact that Eastern plus Mediterranean resource is much larger than that of the West.

Original: English

| WEST ATLANTIC BLUEFIN TUNA SUMMARY (Catches and Biomass in t) | |
|---|---|
| Current (2009) Catch (including discards) | 1,935 t |
| Assuming Low Potential Recruitment | |
| Maximum Sustainable Yield (MSY) | 2,585 (2,409-2,766)[1] |
| Relative Spawning Stock Biomass: | |
| $B_{2009}/B_{MSY|R}$ | 1.1 (0.89-1.35)[1] |
| Relative Fishing Mortality[2]: | |
| $F_{2006-2008}/F_{MSY|R}$ | 0.73 (0.59-0.91)[1] |
| $F_{2006-2008}/F_{0.1}$ | 1.11 (0.91-1.31)[1] |
| $F_{2006-2008}/F_{max}$ | 0.57 (0.48-0.68)[1] |
| Assuming High Potential Recruitment | |
| Maximum Sustainable Yield (MSY) | 6,329 (5,769-7,074)[1] |
| Relative Spawning Stock Biomass: | |
| $B_{2009}/B_{MSY|R}$ | 0.15 (0.10-0.22)[1] |
| Relative Fishing Mortality[2]: | |
| $F_{2006-2008}/F_{MSY|R}$ | 1.88 (1.49-2.35)[1] |
| $F_{2006-2008}/F_{0.1}$ | 1.11 (0.91-1.31)[1] |
| $F_{2006-2008}/F_{max}$ | 0.57 (0.48-0.68)[1] |
| Management Measures: | [Rec. 08-04] TAC of 1,900 t in 2009 and 1,800 t in 2010, including dead discards. |

[1] Median and approximate 80% confidence interval from bootstrapping from the assessment.
[2] $F_{2006-2008}$ refers to the geometric mean of the estimates for 2006-2008 (a proxy for recent F levels).




**BFTW-Figure 7.** Kobe II matrices giving the chance that the spawning stock biomass (SSB) will exceed the level that will produce MSY in any given year under various constant catch levels for the Base Case assessment under the low recruitment, high recruitment, and combined scenarios. The red, yellow and green regions represent chances of less than 50%, 50-59% and 60% or better, respectively.

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**Original: English**

*8.6 BLUE MARLIN AND WHITE MARLIN*

*BUM/WHM-1. Biology*

The central and northern Caribbean Sea and northern Bahamas have historically been known as the primary spawning area for blue marlin in the western North Atlantic. Recent reports show that blue marlin spawning can also occur north of the Bahamas in an offshore area near Bermuda at about 32°-34° North. Ovaries of female blue marlin caught by artisanal vessel in Côte d'Ivoire show evidence of pre-spawning and post-spawning, but not of spawning. In this area females are more abundant than males (4:1 female/male ratio). Coastal areas off West Africa have strong seasonal upwelling, and may be feeding areas for blue marlin.

Previous reports have mentioned spawning of white marlin off southeast Brazil (25° to 26°S and 45° to 45°W) in the same area where blue marlin spawn. In this area blue marlin spawn from April to June and white marlin spawn from December to March. In the northwest Atlantic white marlin have been reported spawning in the Gulf of Mexico in June. Recent reports confirm that white marlin also spawns offshore and north of the Antilles (19° to 23°N and 60° to 70°W) between April and July.

Atlantic blue marlin inhabit the upper parts of the open ocean. Although they spend much of the time on the upper mixed layer they dive regularly to maximum depths of around 300 m, with some vertical excursions down to 800m. They don't confine themselves to a narrow range of temperatures but most tend to be found in waters warmer than 17°C. The distributions of times at depth are significantly different between day and night. At night, the fish spent most of their time at or very close to the surface. During daylight hours, they are typically below the surface, often at 40 to 100+ m. These patterns, however, can be highly variable between individuals and also vary depending on the temperature and dissolved oxygen of the surface mixed layer. This variability in the use of habitat by marlins indicates that simplistic assumptions about habitat usage made during the standardization of CPUE data may be inappropriate.

All biological material sampled to date from white marlin, prior to the confirmation of the existence of roundscale spearfish (*T. georgii*) in 2006, contains unknown mixture of the round scale spearfish and white marlin. Therefore reproductive parameters, growth curves and other biological studies previously thought to describe white marlin may not exclusively represent this species.

*BUM/WHM-2. Fishery indicators*

It has now been confirmed that white marlin landings reported to ICCAT include roundscale spearfish in significant numbers, so that historical statistics of white marlin include a mixture of two species. Studies where white marlin/roundscale spearfish ratios have been estimated with an overall ratio between 23-27%, which previously was thought to represent only white marlin were carried out. In some areas, however, only one species is present in these samples.

The geographic distribution of the catches is given in **BUM/WHM-Figure 1**. The Committee used Task I catches as the basis for the estimation of total removals (**BUM/WHM-Figure 2**). Total removals for the period 1990-2004 were obtained during the 2006 assessment by modifying Task I values with the addition of blue marlin and white marlin that the Committee estimated from catches reported as billfish unclassified. Additionally the reporting gaps were filled with estimated values for some fleets. Estimates of total removals since 2005 only represent task I data.

During the 2006 marlin assessment (Anon. 2007b) it was noted that catches of blue marlin and white marlin continued to decline through 2004. Over the last 15 years, Antillean artisanal fleets have increased the use of Moored Fish Aggregating Devices (MFAD) to capture pelagic fish. Catches of blue marlin caught around MFADs are known to be significant but reports on these catches made to ICCAT are very incomplete. Recent reports from purse seine fleets in West Africa suggest that blue marlin is more commonly caught with tuna schools associated with FADs than with free tuna schools. Task I catches of blue marlin (BUM/WHM-Table 1) in 2009 were - 2,868 t. In 2008, Task I catches of blue marlin were 4,138 t. Task I catches of white marlin in 2008 and 2009 were 374 t and 406 t, respectively (BUM/WHM-Table 2). Task I catches of white marlin and blue marlin for 2009 are preliminary. Historical reports of unclassified billfish remain an important issue in the estimation of historical removals from marlin stocks.

A number of relative abundance indices were estimated during the blue marlin 2010 data preparatory Meeting. However, given the apparent shift in landings from industrial to non-industrial fleets in recent times, it is imperative that CPUE indices are developed for all fleets that have substantial landings.

During the 2006 assessment combined indices for both species were estimated to have declined during the period 1990-2004. However, the trends for 2001-2004 suggest that the decline in abundance of blue marlin may have slowed or halted, and that the decline in white marlin may have reversed, with abundance increasing slightly in the most recent years. Trends in white marlin may also inadvertently reflect trends in the abundance of roundscale spearfish. As evidenced by differences between the trends from the individual and combined indices, four years is likely to be too short a period to reach definitive conclusions about abundance trends. Several years of additional data will be required to confirm recent changes in these abundance trends. Relative abundance indices recently developed for blue marlin from CPUE data for a sport fishery in southeastern Brazil, and for the artisanal fishery off Côte d'Ivoire do not appear to conflict with the conclusions of the assessment of blue marlin made in 2006.

*BUM/WHM-3. State of the stocks*

*Blue marlin*

No new information on stock status has been provided since the 2006 assessment (Anon. 2007b). The recent biomass level most likely remains well below the $B_{MSY}$ estimated in 2000. Current and provisional diagnoses suggest that F declined during 2000-2004 and was possibly smaller than $F_{replacement}$[1] but larger than the $F_{MSY}$ estimated in the 2000 assessment. Over the period 2001-2005 several abundance indicators suggest that the decline has been at least partially arrested, but some other indicators suggest that abundance has continued to decline. During the 2010 ICCAT BUM Data Preparatory Meeting, catch rate information was updated by the presentation of five new standardized catch rate indices, and the inclusion of a historical catch rate index from the sport fishery from Venezuela (BUM-WHM-Figure 3). The 2011 stock assessment, might confirm if these recent apparent changes in trend have continued.

*White marlin*

No new information on stock status has been provided since the 2006 assessment (Anon. 2007b). The biomass for 2000-2004 most likely remained well below the $B_{MSY}$ estimated in the 2002 assessment. During the last assessment, it was estimated that F 2004 was probably smaller than $F_{replacement}$ and

[1] $F_{replacement}$ is the fishing mortality that will maintain the biomass constant from one year to the next. Thus, biomass is expected to grow when $F<F_{replacement}$ and vice-versa.

probably also larger than the $F_{MSY}$ estimated in the 2002 assessment. Over the period 2001-2004 combined longline indices and some individual fleet indices suggest that the decline has been at least partially reversed, but some other individual fleet indices suggest that abundance has continued to decline. The next stock assessment, might confirm if these recent apparent changes in trend have continued. However, this will require developing a mechanism to separate landings of WHM from roundscale spearfish. All historical indices of abundance of white marlin may inadvertently have included an unknown quantity of roundscale spearfish.

*BUM/WHM-4. Outlook*

No new information on the recovery/outlook for marlins has been provided since the 2006 assessment (Anon. 2007b). The Commission's current management plan has the potential of recovering the stocks of blue marlin and white marlin to the $B_{MSY}$ level. However, reports of recent increases in catches of blue marlin by artisanal fisheries in both sides of the Atlantic may negate the effectiveness of the ICCAT plan that aims to recover this stock.

The last stock assessment suggested that the recovery of blue marlin stock might proceeded faster than would have been estimated at the 2000 assessment (Anon. 2001), provided catches remain at the level estimated for 2004. Some signs of stabilization in the abundance trend are apparent in the most recent catch per unit of effort data of blue marlin (2000-2004). Similarly, some signs of a recovery trend are apparent in the most recent catch per unit of effort data for white marlin (2000-2004), although recent information suggests that these data may inadvertently have included roundscale spearfish.

It should be noted that these trends are based only on a few years of observations. Confirmation of these recent apparent changes in abundance trends of white marlin and blue marlin are needed.

The presence of unknown quantities of roundscale spearfish in the biological parameters, historical landings and relative abundance estimates of white marlin make the stock status and outlook for this species more uncertain.

*BUM/WHM-5. Effect of current regulations*

Recommendations [Rec. 00-13], [Rec. 01-10] and finally [Rec. 02-13] placed additional catch restrictions for blue marlin and white marlin. The latter established that "*the annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing must be no more than 33% for white marlin and 50% for blue marlin of the 1996 or 1999 landing levels, whichever is greater*". That recommendation established that, "All blue marlin and white marlin brought to pelagic longline and purse seine vessels alive shall be released in a manner that maximizes their survival. The provision of this paragraph does not apply to marlins that are dead when brought along the side of the vessel and that are not sold or entered into commerce". The Committee estimated the catch of pelagic longline vessels for a subset of fleets that the Committee thought would be expected to be affected by Recommendations [Rec. 00-13] and [Rec. 02-13]. Catches of these fleets represent, 97% of all longline caught blue marlin and 93% of all longline caught white marlin for the period 1990-2007. Catches of both species have declined since 1996-99, the period selected as the reference period by the recommendations. Since 2002, the year of implementation of the last of these two recommendations, the catch of blue marlin has been below the 50% value recommended by the Commission. Similarly, the catch of white marlin since 2002 has been at about the 33% value recommended by the Commission (**BUM/WHM-Figure 4**). This analysis represents only longline caught marlin even though the recommendations referred to the combined catch of pelagic longline and purse seine because the catch estimates of billfish by-catch from purse seine vessels are more uncertain than those from longline. Over the period considered, purse seine caught marlin represent 2% of the total catch reported by the combination of purse seine and pelagic longline.

Some fisheries/fleets are using circle hooks, which can minimize deep hooking and increase the survival of marlins hooked on longlines and recreational gear. More countries have started reporting data on live releases in 2006. Additionally, more information has come about, for some fleets, on the potential for using gear modifications to reduce the by-catch and increase the survival of marlins. Such studies have also provided information on the rates of live releases for those fleets. However there is not enough information on the proportion of fish being released alive for all fleets, to evaluate the effectiveness of the ICCAT recommendation relating to the live release of marlins.

*BUM/WHM-6. Management recommendations*

- The Commission should, at a minimum, continue the management measures already in place because marlins have not yet recovered.

- The Commission should take steps to assure that the reliability of the recent fishery information improves in order to provide a basis for verifying possible future rebuilding of the stocks. Improvements are needed in the monitoring of the fate and amount of dead and live releases, with verification from scientific observer programs; verification of current and historical landings from some artisanal and industrial fleets; and complete and updated relative abundance indices from CPUE data for the major fleets.

- The Commission should consider requiring the reporting of roundscale spearfish catches separate from white marlin.

- Should the Commission wish to increase the likelihood of success of the current management measures of the marlin rebuilding plan, further reduction in mortality would be needed, for example by:
  - implementing plans to improve compliance of current regulations,
  - encouraging the use of alternative gear configurations that reduce the likelihood of deep hooking. Depending on the fisheries/fleets, such reductions may be achievable by making changes in hook type, bait type or a combination of the two,
  - broader application of time/area catch restrictions.

- Given the recent importance of the catch from artisanal fisheries, and to increase the likelihood of recovery of marlin stocks, the Commission should consider regulations that control or reduce the fishing mortality generated by these fisheries.

- While substantial research into habitat requirements of blue and white marlin have been undertaken since the last assessments, the results of this research are not yet sufficient to allow the Committee to reach scientific consensus on the best method for directly estimating MSY benchmarks for these species based on the complete time-series of data. The Commission should encourage continued research on development of methods to incorporate this information into stock assessments in order to provide a basis for increasing the certainty with which management advice can be provided.

**Atlantic Blue Marlin and Atlantic White Marlin Summary**

| | WHM | BUM |
|---|---|---|
| $B_{2004}$ / [1]$B_{MSY}$ | < 1.0 | < 1.0 |
| Recent Abundance Trend (2001-2004) | Slightly upward | Possibly stabilizing |
| $F_{2004} > F_{replacement}$ | No | Possibly |
| $F_{2004}$ > [1]$F_{MSY}$ | Possibly > 1.0 | > 1.0 |
| [2]$Catch_{recent}/Catch_{1996}$ Longline and Purse seine | 0.47 | 0.52 |
| [3]$Catch_{2004}$ | 610 t | 2,916 t |
| Catch 2009 | 406 t | 2,868 t |
| Rebuilding to $B_{MSY}$ | Potential to rebuild under current management plan but needs verification. | Potential to rebuild under current management plan but needs verification. |
| [1]MSY | [4] 600-1,320 t | ~ 2,000 t (1,000 ~ 2,400 t) |

[1] As estimated during the 2000 (Anon. 2001) and 2002 (Anon. 2003) assessments.
[2] Catch $_{recent}$ is the average longline catch for 2000-2004.
[3] Estimate of total removals obtained by the Committee.
[4] Range of estimates were obtained in the previous assessments, but recent analyses suggest that the lower bound for white marlin should be at least 600 t.

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## *8.7 SAI - SAILFISH*

Sailfish *(Istiophorus platypterus)* has a pan-tropical distribution. ICCAT has established, based on life history information on migration rates and geographic distribution of catch, that there are two management units for Atlantic sailfish, eastern and western (**SAI-Figure 1**). The first successful assessment that estimated reference points for eastern and western sailfish stocks was conducted in 2009.

### *SAI-1. Biology*

Larval sailfish are voracious feeders initially feeding on crustaceans from the zooplankton but soon switching to a diet of fish larvae. Temperature preferences for adult sailfish appear to be in the range of 25-28°C. A study undertaken in the Strait of Florida and the southern Gulf of Mexico indicated that habitat preferences from satellite tagged sailfish were primarily within the upper 20~50 m of the water column. The tag data also indicated common short-term movements to depths in excess of 100 m, with some dives as deep as 350 m. Sailfish is the most coastal of all billfish species and conventional tagging data suggest that they move shorter distances than the other billfish (**SAI-Figure 2**). Sailfish grow rapidly and reach a maximum size of 160 cm for males and 220 cm for females, with females reaching maturity at 155 cm. Sailfish reach a maximum age of at least 17 years.

Sailfish spawn over a wide area and year around. In the North, evidence of spawning has been detected in the Straits of Florida, and off the Venezuelan, Guyanese and Surinamese coasts. In the southwest Atlantic, spawning occurs off the southern coast of Brazil between 20° and 27°S, and in the east Atlantic, off Senegal and Côte d'Ivoire. Timing of spawning can differ between regions. From the Florida Straits to the areas off Guyana sailfish spawn in the second semester of the year, whilst in the southwestern Atlantic and the tropical eastern Atlantic they spawn late and early in the year.

### *SAI-2. Description of the fisheries*

Sailfish are targeted by coastal artisanal and recreational fleets and, to a less extent, are caught as by-catch in longline and purse seine fisheries (**SAI-Figure 1**). Historically, catches of sailfish were reported together with spearfish by many longline fleets. In 2009 these catches were separated by the Species Group (**SAI-Table 1**). Historical catches of unclassified billfish continue to be reported to the Committee making the estimation of sailfish catch difficult. Catch reports from countries that have historically been known to land sailfish continue to suffer from gaps and there is increasing ad-hoc evidence of un-reported landings in some other countries. These considerations provide support to the idea that the historical catch of sailfish has been under-reported, especially in recent times where more and more fleets encounter sailfish as by-catch or target them.

Reports to ICCAT estimate that the Task I catch for 2009 was 1,641 t and 1,421 t for the east and west stocks, respectively (**SAI-Figure 3**). Task I catches of sailfish for 2009 are preliminary because they do not include reports from all fleets.

### *SAI-3. State of the stocks*

ICCAT recognizes the presence of two stocks of sailfish in the Atlantic, the eastern and western stocks. There is increasing evidence that an alternative stock structure with a north western stock and a south/eastern stock should be considered. Assessments of stocks based on the alternative stock structure option have not been done to date, however, conducting them should be a priority for future assessments.

In 2009 ICCAT conducted a full assessment of both Atlantic sailfish stocks SCRS/2009/012 through a range of production models and by using different combinations of relative abundance indices (**SAI-Figure 4**). It is clear that there remains considerable uncertainty regarding the stock status of these two stocks, however, many assessment model results present evidence of overfishing and evidence that the stocks are overfished, more so in the east than in the west. Although some of the results suggest a healthy stock in the west, few suggest the same for the east. The eastern stock is also assessed to be more productive than the western stock, and probably able to provide a greater MSY. The eastern stock is likely to be suffering stronger overfishing and most probably has been reduced further below the level that would produce the MSY than the western stock. Reference points obtained with other methods reach similar conclusions.

Examination of recent trends in abundance suggests that both the eastern and western stocks suffered their greatest declines in abundance prior to 1990. Since 1990, trends in relative abundance conflict between different indices, with some indices suggesting declines, other increases and others not showing a trend (**SAI-Figure 4**). Examination of available length frequencies for a range of fleets show that average length and length distributions do not show clear trends during the period where there are observations. A similar result was obtained in the past for marlins. Although it is possible that, like in the case of the marlins, this reflects the fact that mean length is not a good indicator of fishing pressure for billfish it could also reflect a pattern of high fishing pressure over the period of observation.

*SAI-4. Outlook*

Both the eastern and western stocks of sailfish may have been reduced to stock sizes below $B_{MSY}$. There is considerable uncertainty on the level of reduction, particularly for the west, as various production model fits indicated the biomass ratio $B_{2007}/B_{MSY}$ both above and below 1.0. The results for the eastern stock were more pessimistic than those for the western stock in that more of the results indicated recent stock biomass below $B_{MSY}$. Therefore there is particular concern over the outlook for the eastern stock.

*SAI-5. Effect of current regulations*

No ICCAT regulations for sailfish are in effect, however, some countries have established domestic regulations to limit the catch of sailfish. Among these regulations are: requirement of releasing all billfish from longline vessels, minimum size restrictions, circle hooks and catch and release strategies in sport fisheries.

*SAI-6. Management recommendations*

The Committee recommends that catches for the eastern stock should be reduced from current levels. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch along the African coast.

The Committee recommends that catches of the western stock of sailfish should not exceed current levels. Any reduction in catch in the West Atlantic is likely to help stock re-growth and reduce the likelihood that the stock is overfished. It should be noted, however, that artisanal fishermen harvest a large part of the sailfish catch of the western sailfish stock.

The Committee is concerned about the incomplete reporting of sailfish catches, particularly for the most recent years, because it increases uncertainty in stock status determination. The Committee recommends all countries landing or having dead discards of sailfish, report these data to the ICCAT Secretariat.

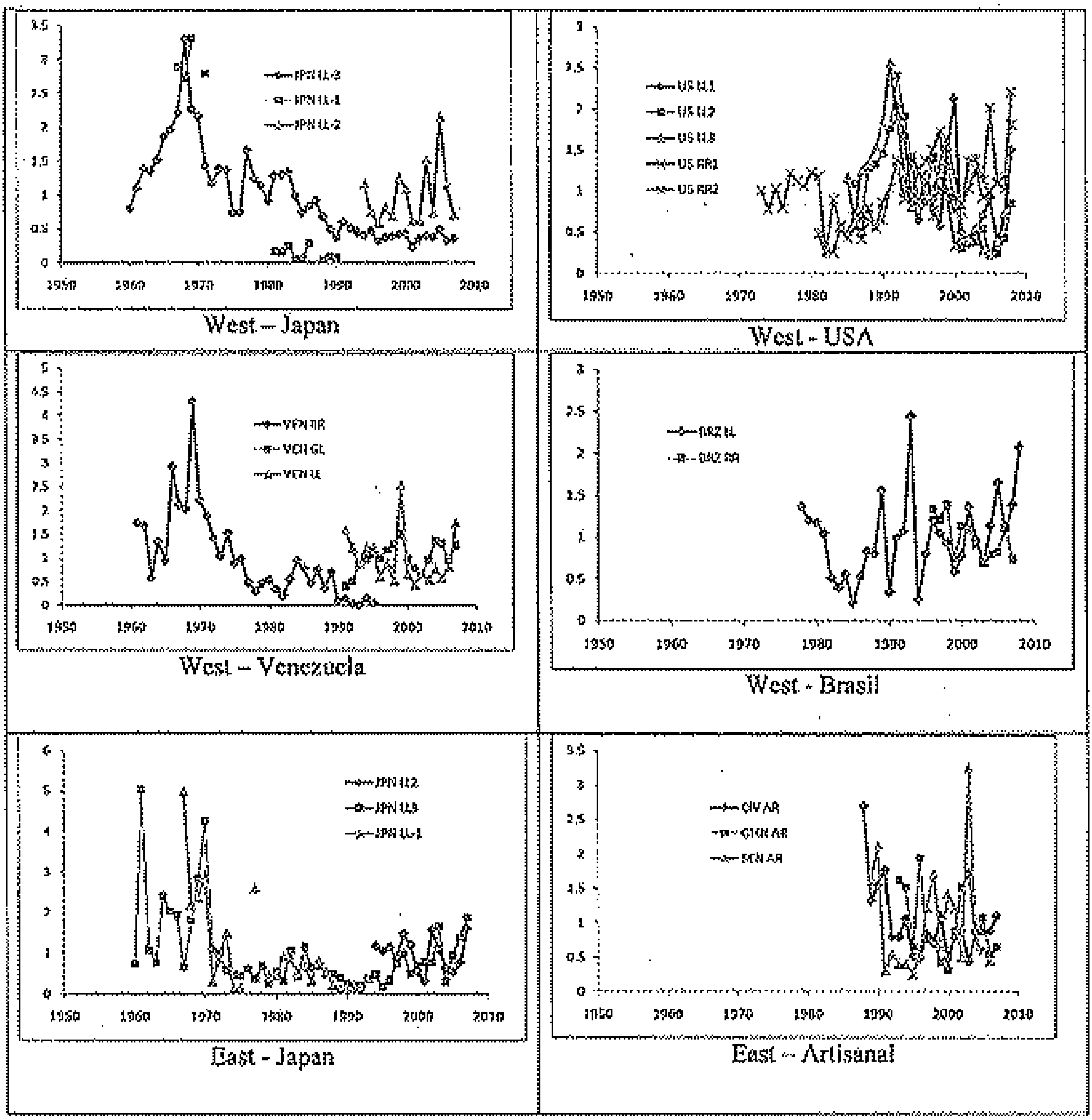
**ATLANTIC SAILFISH SUMMARY**

| | West Atlantic | East Atlantic |
|---|---|---|
| Maximum Sustainable Yield (MSY) | 600-1,100[1] t | 1,250-1,950[1] t |
| Recent Yield (2007) | 1,188 t | 2,281 t |
| $B_{2007}/B_{MSY}$ | Possibly < 1.0 | Likely < 1.0 |
| $F_{2007}/F_{MSY}$ | Possibly > 1.0 | Likely > 1.0 |
| 2008 Replacement Yield | not estimated | not estimated |
| 2009 Catches | 1,421 t | 1,641 t |
| Management Measures in Effect | None[2] | None[2] |

[1] Results from Bayesian production model with informative priors. These results represent only the uncertainty in the production model fit. This range underestimates the total uncertainty in the estimates of MSY.
[2] Some countries have domestic regulations.

SAI-Table 1. Estimated catches (t) of Atlantic sailfish (Istiophorus albicans) by area, gear and flag.
SAI-Tableau 1. Prises estimées (t) de voilier de l'Atlantique (Istiophorus albicans) par zone, engin et pavillon.
SAI-Tabla 1. Capturas estimadas (t) de pez vela del Atlántico (Istiophorus albicans) por area, arte, y bandera.

| | | | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL | | | 3274 | 3276 | 3699 | 3180 | 2673 | 3475 | 2591 | 3105 | 3093 | 2231 | 2358 | 2923 | 2500 | 2705 | 2724 | 3217 | 3587 | 3560 | 3359 | 3633 | 3399 | 2582 | 3544 | 3053 | 2589 |
| | ATE | | 2269 | 2065 | 2553 | 2109 | 1710 | 2315 | 1476 | 1780 | 1815 | 1172 | 1234 | 1881 | 1337 | 1362 | 1342 | 1694 | 2136 | 1579 | 2043 | 2237 | 1964 | 1553 | 2395 | 1794 | 1174 |
| | ATW | | 1004 | 1212 | 1146 | 1071 | 963 | 1160 | 1115 | 1325 | 1278 | 1059 | 1124 | 1041 | 1163 | 1346 | 1382 | 1523 | 1451 | 1981 | 1316 | 1396 | 1435 | 1028 | 1149 | 1258 | 1415 |
| Landings | ATE | Longline | 89 | 99 | 99 | 93 | 112 | 109 | 47 | 104 | 256 | 151 | 189 | 156 | 206 | 275 | 273 | 167 | 255 | 311 | 270 | 259 | 294 | 461 | 577 | 559 | 559 |
| | | Other surf. | 1940 | 1394 | 1870 | 1479 | 1155 | 1249 | 1000 | 983 | 1111 | 954 | 910 | 1504 | 644 | 859 | 883 | 976 | 1114 | 1170 | 1491 | 1758 | 1527 | 1047 | 1629 | 1126 | 487 |
| | | Sport (HL+RR) | 240 | 371 | 584 | 537 | 445 | 957 | 429 | 692 | 448 | 67 | 135 | 182 | 486 | 228 | 186 | 551 | 767 | 98 | 282 | 219 | 143 | 46 | 189 | 105 | 128 |
| | ATW | Longline | 417 | 420 | 425 | 354 | 316 | 316 | 150 | 357 | 484 | 346 | 338 | 260 | 323 | 459 | 533 | 600 | 978 | 1263 | 871 | 747 | 1062 | 646 | 684 | 975 | 945 |
| | | Other surf. | 274 | 295 | 167 | 208 | 238 | 514 | 521 | 595 | 498 | 468 | 410 | 482 | 433 | 553 | 615 | 603 | 401 | 603 | 440 | 642 | 368 | 374 | 452 | 267 | 458 |
| | | Sport (HL+RR) | 313 | 496 | 491 | 472 | 352 | 269 | 571 | 333 | 233 | 217 | 348 | 238 | 350 | 267 | 163 | 76 | 60 | 106 | 0 | 0 | 0 | 2 | 6 | 7 | 5 |
| Discards | ATW | Longline | 0 | 0 | 42 | 57 | 57 | 67 | 64 | 36 | 63 | 28 | 29 | 69 | 57 | 27 | 71 | 65 | 11 | 7 | 5 | 7 | 3 | 5 | 5 | 9 | 9 |
| | | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Landings | ATE | Benin | 50 | 25 | 32 | 46 | 8 | 21 | 20 | 21 | 20 | 20 | 20 | 19 | 6 | 4 | 5 | 5 | 12 | 2 | 2 | 5 | 3 | 3 | 4 | 0 | |
| | | Cape Verde | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | China P.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 3 | 5 | 9 | 4 | 5 | 11 | 4 | 4 | 8 | 16 | 8 | 1 | 4 |
| | | Chinese Taipei | 3 | 0 | 1 | 2 | 3 | 5 | 4 | 20 | 157 | 38 | 58 | 24 | 56 | 44 | 66 | 45 | 50 | 62 | 49 | 15 | 25 | 36 | 109 | 104 | 65 |
| | | Cuba | 19 | 55 | 50 | 22 | 53 | 61 | 184 | 200 | 77 | 83 | 72 | 533 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Côte D'Ivoire | 40 | 40 | 40 | 66 | 55 | 52 | 38 | 69 | 40 | 54 | 65 | 91 | 65 | 35 | 85 | 45 | 47 | 65 | 121 | 73 | 93 | 78 | 52 | 448 | 74 |
| | | EU.España | 7 | 9 | 19 | 28 | 44 | 0 | 13 | 3 | 47 | 8 | 13 | 62 | 38 | 15 | 20 | 8 | 150 | 210 | 183 | 148 | 177 | 200 | 257 | 286 | 280 |
| | | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 2 | 1 | 7 | 27 | 53 | 11 | 3 | 8 | 13 | 19 | 31 | 136 | 43 | 49 | 103 |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | | Gabon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 110 | 218 | 2 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | |
| | | Ghana | 1485 | 925 | 1392 | 837 | 465 | 395 | 463 | 297 | 693 | 450 | 353 | 305 | 196 | 351 | 305 | 275 | 565 | 592 | 566 | 521 | 542 | 282 | 420 | 342 | 353 |
| | | Honduras | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Japan | 41 | 32 | 16 | 26 | 26 | 31 | 6 | 15 | 27 | 45 | 52 | 47 | 19 | 58 | 16 | 26 | 6 | 30 | 21 | 20 | 50 | 62 | 144 | 199 | 125 |
| | | Korea Rep. | 39 | 2 | 8 | 11 | 12 | 12 | 22 | 2 | 2 | 5 | 5 | 11 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Liberia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 85 | 43 | 136 | 122 | 154 | 56 | 133 | 127 | 106 | 122 | 138 | 115 | 0 | |
| | | Maroc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 |
| | | Mixed flags (FR+ES) | 364 | 403 | 394 | 408 | 432 | 595 | 174 | 150 | 182 | 160 | 128 | 97 | 110 | 135 | 131 | 98 | 44 | 39 | 44 | 41 | 35 | 32 | 36 | 0 | |
| | | NEI (ETRO) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 51 | 57 | 69 | 86 | 127 | 120 | 77 | 43 | 3 | 2 | 16 | 7 | 8 | 10 | 0 | |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| | | S. Tomé e Príncipe | 0 | 0 | 0 | 73 | 86 | 97 | 34 | 78 | 81 | 78 | 72 | 96 | 139 | 141 | 141 | 136 | 136 | 136 | 136 | 515 | 346 | 292 | 384 | 0 | |
| | | Senegal | 241 | 572 | 556 | 587 | 557 | 1048 | 466 | 660 | 462 | 162 | 167 | 240 | 560 | 260 | 258 | 786 | 953 | 240 | 675 | 587 | 463 | 256 | 737 | 446 | 164 |
| | | St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 5 | 0 | |
| | | Togo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 22 | 36 | 23 | 62 | 55 | 95 | 135 | 47 | 31 | 71 | 0 | |
| | | U.S.A. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 1 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | U.S.S.R. | 0 | 2 | 5 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | ATW | Aruba | 30 | 30 | 23 | 26 | 16 | 13 | 9 | 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Barbados | 0 | 0 | 0 | 0 | 69 | 45 | 29 | 42 | 58 | 46 | 74 | 25 | 71 | 55 | 45 | 44 | 42 | 26 | 27 | 26 | 42 | 58 | 42 | 0 | |
| | | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 12 | 0 | |
| | | Brasil | 187 | 292 | 174 | 152 | 147 | 381 | 90 | 351 | 243 | 129 | 245 | 310 | 137 | 184 | 356 | 598 | 412 | 547 | 585 | 534 | 416 | 139 | 123 | 222 | 432 |
| | | China P.R. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 3 | 3 | 9 | 4 | 5 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| | | Chinese Taipei | 12 | 38 | 9 | 92 | 86 | 42 | 37 | 17 | 112 | 117 | 19 | 19 | 2 | 65 | 17 | 11 | 33 | 31 | 13 | 8 | 21 | 5 | 14 | 28 | 5 |
| | | Cuba | 130 | 59 | 171 | 78 | 55 | 126 | 83 | 70 | 42 | 46 | 37 | 37 | 40 | 28 | 196 | 205 | 68 | 32 | 18 | 50 | 72 | 47 | 56 | 0 | |
| | | Dominica | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 3 | 0 | 1 | 0 | 3 | 3 | 4 | 3 |
| | | Dominican Republic | 46 | 12 | 48 | 44 | 44 | 40 | 31 | 98 | 59 | 90 | 60 | 40 | 101 | 89 | 27 | 67 | 81 | 260 | 91 | 144 | 165 | 133 | 147 | 0 | |
| | | EU.España | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 13 | 13 | 19 | 36 | 5 | 30 | 42 | 7 | 14 | 354 | 449 | 196 | 181 | 115 | 146 | 184 | 393 | 451 |
| | | EU.Portugal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 2 | 12 | 12 | 110 | 19 | 55 | 101 | 48 |
| | | Grenada | 164 | 211 | 104 | 114 | 98 | 218 | 316 | 310 | 246 | 151 | 119 | 56 | 83 | 151 | 148 | 164 | 187 | 151 | 171 | 112 | 147 | 159 | 174 | 216 | 183 |
| | | Japan | 16 | 8 | 2 | 5 | 12 | 12 | 27 | 0 | 1 | 8 | 2 | 6 | 17 | 3 | 10 | 12 | 3 | 3 | 8 | 5 | 22 | 4 | 1 | 33 | 42 |




SAI-Figure 4. Relative abundance indices obtained by standardizing cpue data for various fleets. All indices were scaled to the mean of each series prior to graphing.

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### *8.8 SWO-ATL-ATLANTIC SWORDFISH*

The last assessment for Atlantic swordfish was conducted in 2009 (SCRS/2009/016). Other information relevant to Atlantic swordfish is presented in the Report of the Sub-Committee on Statistics, included as **Appendix X** to this SCRS Report, and recommendations pertinent to Atlantic swordfish are presented in Section XX.

#### *SWO-ATL-1. Biology*

Swordfish *(Xiphias gladius)* are members of the family *Xiphiidae* and are in the suborder *Scombroidei*. They can reach a maximum weight in excess of 500 kg. They are distributed widely in the Atlantic Ocean and Mediterranean Sea. In the ICCAT convention area, the management units of swordfish for assessment purposes are a separate Mediterranean group, and North and South Atlantic groups separated at 5°N. This stock separation is supported by recent genetic analyses. However, the precise boundaries between stocks are uncertain, and mixing is expected to be highest at the boundary in the tropical zone. Swordfish feed on a wide variety of prey including groundfish, pelagic fish, deep-water fish, and invertebrates. They are believed to feed throughout the water column, and from recent electronic tagging studies, undertake extensive diel vertical migrations.

Swordfish mostly spawn in the western warm tropical and subtropical waters throughout the year, although seasonality has been reported in some of these areas. They are found in the colder temperate waters during summer and fall months. Young swordfish grow very rapidly, reaching about 140 cm LJFL (lower-jaw fork length) by age three, but grow slowly thereafter. Females grow faster than males and reach a larger maximum size. Tagging studies have shown that some swordfish can live up to 15 years. Swordfish are difficult to age, but about 50% of females were considered to be mature by age five, at a length of about 180cm. However, the most recent information indicates a smaller length and age at maturity.

#### *SWO-ATL-2. Fishery indicators*

Due to the broad geographical distribution of Atlantic swordfish (**SWO ATL-Figure 1**) in coastal and off-shore areas (mostly ranging from 50°N to 45°S), this species is available to a large number of fishing countries (**SWO ATL-Figure 2**). Directed longline fisheries from Canada, EU-Spain, and the United States have operated since the late 1950s or early 1960s, and harpoon fisheries have existed at least since the late 1800s. Other directed swordfish fisheries include fleets from Brazil, Morocco, Namibia, EU-Portugal, South Africa, Uruguay, and Venezuela. The primary by-catch or opportunistic fisheries that take swordfish are tuna fleets from Chinese Taipei, Japan, Korea and EU-France. The tuna longline fishery started in 1956 and has operated throughout the Atlantic since then, with substantial catches of swordfish that are produced as a by-catch of tuna fisheries. The largest proportion of the Atlantic catches is made using surface-drifting longline. However, many additional gears are used, including traditional gillnets off the coast of western Africa.

*Total Atlantic*

The total Atlantic estimated catch (landings plus dead discards) of swordfish (North and South, including reported dead discards) in 2009 (25,103 t) represented a slight increase from that in 2008 (23,551 t). As a small number of countries have not yet reported their 2009 catches and because of unknown unreported catches, this value should be considered provisional and subject to further revision.

In an effort to quantify possible unreported catches in the Convention area during the 2009 stock assessment, the ICCAT Statistical Document data base was examined. The use of this information was complicated because of the lack of conversions factors available for products such as loin, fillet, and gilled/gutted swordfish. The comparison between the swordfish Statistical Document System (s.SDS) data from 2003 through 2007 and the reported Task I by flag indicates that Task I catches might not represent the total landed catch of Convention area swordfish, although the extent to which this occurs was highly uncertain. The largest discrepancy between the data sources is for flags with an unknown area of capture, and amounts to nearly 21,000 t over the 2003-2007 time period. Considering only the s.SDS data classified as coming from the Convention Area, the discrepancy amounts to an estimate of less than 1,000 t over the time period. The comparison implies that international trade of Convention Area landed swordfish might represent less than 13% of the landed catch recorded in Task I and that a surprisingly low number of Contracting Parties engage in export of Convention area swordfish.

*North Atlantic*

For the past decade, the North Atlantic estimated catch (landings plus dead discards) has averaged about 11,332 t per year (**SWO-ATL-Table 1** and **SWO-ATL-Figure 3**). The catch in 2009 (12,655 t) represents a 37% decrease since the 1987 peak in North Atlantic landings (20,236 t). These reduced landings have been attributed to ICCAT regulatory recommendations and shifts in fleet distributions, including the movement of some vessels in certain years to the South Atlantic or out of the Atlantic. In addition, some fleets, including at least the United States, EU-Spain, EU-Portugal and Canada, have changed operating procedures to opportunistically target tuna and/or sharks, taking advantage of market conditions and higher relative catch rates of these species previously considered as by-catch in some fleets. Recently, socio-economic factors may have also contributed to the decline in catch.

Trends in nominal catch rates by fleets contributing to the production model are shown in **SWO-ATL-Figure 4**. Most of the series have an increasing trend since the late 1990s, but the U.S. catch rates remained relatively flat. There have been some recent changes in United States regulations that may have impacted catch rates, but these effects remain unknown.

The 2010 Swordfish Species Group reviewed new information from Canada, which updated its nominal catch rate series for the pelagic longline fishery (SCRS 2010/139). The nominal CPUE increased from 2008 to 2009, continuing the increasing trend that commenced in 1996. The Group agreed with the authors' view that more work was needed to reflect changes in management and targeting practices. It was suggested that since the switch from a competitive fishery to an Individual Transferable Quota based-system occurred in 2002, sufficient time has passed to consider breaking the time series into two, reflecting the two periods of contrasting management approaches.

The most frequently occurring ages in the catch include ages 2 and 3 (**SWO-ATL-Figure 5**). There are reports of increasing average size of the catch in some North Atlantic fisheries, including United States and Canada.

*South Atlantic*

The historical trend of catch (landings plus dead discards) can be divided in two periods: before and after 1980. The first one is characterized by relatively low catches, generally less than 5,000 t (with an average value of 2,300 t). After 1980, landings increased continuously up to a peak of 21,930 t in 1995, levels that are comparable to the peak of North Atlantic harvest (20,236 t). This increase of landings was, in part, due to progressive shifts of fishing effort to the South Atlantic, primarily from the North Atlantic, as well as other waters. Expansion of fishing activities by southern coastal countries, such as Brazil and Uruguay, also contributed to this increase in catches. The reduction in catch following the peak in 1995 resulted from regulations and partly due to a shift to other oceans and target species. In 2009, the 12,448 t reported catches were about 44% lower than the 1995 reported level (**SWO-ATL-Figure 3**).

The SCRS noted that there was a considerable decline in the magnitude of the catch by Namibia in 2009 compared with 2008 (25 and 518 t, respectively) that appeared inconsistent with recent developments in capacity. Namibian authorities will be contacted with a request for an explanation for this apparent anomaly.

As observed in the 2006 assessment, the CPUE trend from targeted and non-targeted fisheries show different trends and high variability which indicates that at least some are not depicting trends in the abundances of the stock (**SWO-ATL-Figure 6**). It was noted that there was little overlap in fishing area and strategies between the by-catch and targeted fleets used for estimating CPUE pattern, and therefore the by-catch and targeted fisheries CPUE trends could be tracking different components of the population.

*Discards*

Since 1991, several fleets have reported dead discards (see **SWO-ATL-Table 1**). The volume of Atlantic-wide reported discards since then has ranged from 151 t to 1,139 t per year. Reported annual dead discards have been declining in recent years.

*SWO-ATL-3. State of the stocks*

*North Atlantic*

Results from the base case production model are shown in **SWO-ATL-Figure 7**. The estimated relative biomass trend shows a consistent increase since 2000. The current results indicate that the stock is at or above $B_{MSY}$. The relative trend in fishing mortality shows that the level of fishing peak in 1995, followed by a decrease until 2002, followed by small increase in the 2003-05 period and downward trend since then. Fishing mortality has been below $F_{MSY}$ since 2005. The results suggest that there is greater than 50% probability that the stock is at or above $B_{MSY}$, and thus the Commission's rebuilding objective [99-2] has been achieved (**SWO-ATL-Figure 8**). However, it is important to note that since 2003 the catches have been below the TAC's greatly increasing the chances for a fast recovery. Overall, the stock was estimated to be somewhat less productive than the previous assessment, with the intrinsic rate of increase, *r*, estimated at 0.44 compared to 0.49 in 2006.

Other analyses conducted by the SCRS (Bayesian surplus production modeling, and Virtual Population analyses) generally support the results described for the base case surplus production model above.

*South Atlantic*

The results of the base case production model indicated that there were conflicting signals for several of the indices used. The model estimated overall index was relatively stable until the early 1980s when it started declining until the late 1990's and it reversed that trend about 2003. Estimated relative fishing mortality ($F_{2009}/F_{MSY}$) was 0.75 indicating that the stock is not being overexploited. Estimated relative biomass ($B_{2009}/B_{MSY}$) was 1.04 (**SWO-ATL-Figure 9**), indicating that the stock was not overexploited.

Because of the high level of uncertainty associated with the south Atlantic production models results, the SCRS conducted catch-only modeling analysis, including two explorations using different assumptions concerning the intrinsic rate of population increase. The distribution for MSY was skewed for both runs (**SWO-ATL-Figure 10**). The median of MSY estimated for RUN 1 was 18,130 t and for RUN 2 was 17,934 t. **SWO-ATL-Figure 11** summarizes recent stock status, as determined from the catch-only model.

*SWO-ATL-4. Outlook*

*North Atlantic*

The base production model was projected to the year 2018 under constant TAC scenarios of 10, 11, 12, 13, 14 and 15 thousand tones. Catch in year 2009 was assumed to be the average of the last three years (2006-08) (11,515 t). The actual reported landings in 2009 were 12,655 t. Median trajectories for biomass and fishing mortality rate for all of the future TAC scenarios are plotted in **SWO-ATL-Figure 12**.

Future TACs above MSY are projected to result in 50% or lower probabilities of the stock biomass remaining above $B_{MSY}$ over the next decade (**SWO-ATL-Figure 13**) as the resulting probability of F exceeding $F_{MSY}$ for these scenarios would trend above 50% over time. A TAC of 13,000 t would provide approximately a 75% probability of maintaining the stock at a level consistent with the Convention Objective over the next decade.

*South Atlantic*

Projections for the base case production model were performed for catch levels from 10,000 t to 16,000 t by increments of 1,000 t for years 2010-2020. For year 2009, all projection scenarios assumed a catch equal to the average catch for 2006-2008 (13,658 t). **SWO-ATL-Figure 14** shows the results of the projections. Because the SCRS considers that the production model estimated benchmarks are poorly estimated, the projections are shown as biomass changes rather than relative biomass. In general, catches of 14,000 t or less will result in increases in the biomass of the stock, catches on the order of 15,000 will maintain the biomass of the stock at approximately stable levels during the period projected. Catches in the order of 16,000 t or more will result in biomass decrease. The current TAC is 17,000 t.

For the catch only model projections, constant catch scenarios were evaluated ranging from 10,000 to 17,000 t, incremented by 1,000 t for a period of 10 years. For 2009, all projection scenarios assumed a catch equal to the average catch for 2006-2008 (13,658 t). In general, catches of 15,000 t will result in the biomasses being higher than $B_{MSY}$ 80% of the time. **SWO-ATL-Figure 15** summarizes the probability of $B>B_{MSY}$ and $F<F_{MSY}$ for the constant catch scenarios indicated over time. Catches on the order of 17,000 will result in a probability of 0.67 of the biomass being above $B_{MSY}$ in ten years.

*SWO-ATL-5. Effects of current regulations*

In 2006, the Committee provided information on the effectiveness of existing minimum size regulations. New catch regulations were implemented on the basis of Rec. 06-02, which entered into effect in 2007 (Rec. 08-02 extended the provisions of Rec. 06-02 to include 2009). Finally, Rec. 09-02 came into effect in 2010 and extended most of the provisions of Rec. 06-02 for one year only.

*Catch limits*

The total allowable catch in the North Atlantic during the 2007 to 2009 period was 14,000 t per year. The reported catch during that period averaged 12,096 t and did not exceed the TAC in any year. Reports for 2009 are considered provisional and subject to change.

The total allowable catch in the South Atlantic for the years 2007 through 2009 was 17,000 t. The reported catch during that period averaged 13,455 t, and did not exceed the TAC in any year. Reports for 2009 are considered provisional and subject to change.

*Minimum size limits*

There are two minimum size options that are applied to the entire Atlantic: 125 cm LJFL with a 15% tolerance, or 119 cm LJFL with zero tolerance and evaluation of the discards.

For the 2006-2008 period, the estimate of the percentage of swordfish reported landed (throughout the Atlantic) less than 125 cm LJFL was about 24% (in number) overall for all nations fishing in the Atlantic (28% in the northern stock and 20% in southern stock). If this calculation is made using reported landings plus estimated dead discards, then the percentage less than 125 cm LJFL would be of the same order given the relatively small amount of discards reported. These estimates are based on the overall catch at size, which have high levels of substitutions for a significant portion of the total catch.

*Other implications*

The Committee is concerned that in some cases national regulations have resulted in the unreported discarding of swordfish caught in the North stock and, to a certain extent, could have influenced similar behavior of the fleet that fishes the South Atlantic swordfish stock. The Committee considers that these regulations may have had a detrimental effect on the availability and consistency of scientific data on catches, sizes and CPUE indices of the Atlantic fleet. The Committee expressed its serious concern over this limitation on data for future assessments.

*SWO-ATL-6. Management recommendations*

*North Atlantic*

Consistent with the goal of the Commission's swordfish rebuilding plan [Rec. 96-02], in order to maintain the northern Atlantic swordfish stock at a level that could produce MSY, with greater than 50% probability, the Committee recommended reducing catch limits allowed by Rec. 06-02 (15,345 t) to no more than 13,700 t, which reflects the current best estimate of maximum yield that could be harvested from the population under existing environmental and fishery conditions. Should the Commission wish to have greater assurance that future biomass would be at or above $B_{MSY}$ while maintaining F at or below $F_{MSY}$, the Commission should select a lower annual TAC, depending on the degree of precaution the Commission chooses to apply in management.

The Committee noted that allowable catch levels agreed in [Recs. 06-02 and 08-02] exceeded scientific recommendations. The successful rebuilding of this stock could have been compromised if recent catches had been higher than realized.

*South Atlantic*

Until sufficiently more research has been conducted to reduce the high uncertainty in stock status evaluations for the southern Atlantic swordfish stock, the Committee emphasizes that annual catch should not exceed the provisionally estimated MSY (15,000). Considering the unquantified uncertainties and the conflicting indications for the stock, the Committee recommends a more precautionary Fishery Management approach, to limit catches to the recent average level (~15,000 t), which are expected to maintain the catch rates at about their current level.

**ATLANTIC SWORDFISH SUMMARY**

| | North Atlantic | South Atlantic |
|---|---|---|
| Maximum Sustainable Yield[1] | 13,730 t (13,020-14,182)[3] | ~15,000 t |
| Current (2009) TAC | 14,000 t | 15,000 t |
| Current (2009) Yield[2] | 12,655 t | 12,448 t |
| Yield in last year used in assessment (2008) | 11,188 t[5] | 12,363 t[5] |
| $B_{MSY}$ | 61,860 (53,280-91,627) | 47,700 |
| $F_{MSY}$ | 0.22 (0.14-0.27) | 0.31 |
| Relative Biomass ($B_{2009}/B_{MSY}$) | 1.05 (0.94-1.24) | 1.04 (0.82-1.22) |
| Relative Fishing Mortality ($F_{2008}/F_{MSY}$[1]) | 0.76 (0.67-0.96) | 0.75 (0.60-1.01) |
| Stock Status | Overfished: NO<br>Overfishing: NO | Overfished: NO<br>Overfishing: NO |
| Management Measures in Effect: | Country-specific TACs [Recs. 06-02, 08-02 and 09-02];<br>125/119cm LJFL minimum size | Country-specific TACs [Rec. 06-03 and 09-03];<br>125/119cm LJFL minimum size |

[1] Base Case production model (Logistic) results based on catch data 1950-2008.
[2] Provisional and subject to revision.
[3] 80% bias corrected confidence intervals are shown.
[4] Provisional and preliminary, based on production model results that included catch data from 1970-2008.
[5] As of Sept. 29, 2010.

SWO-ATL-Table 1. Estimated catches (t) of Atlantic swordfish (Xiphias gladius) by gear and flag.
SWO-ATL-Tableau 1. Prises estimées (t) d'espadon de l'Atlantique (Xiphias gladius) par engin et pavillon.
SWO ATL-Tabla 1. Capturas estimadas de pez espada del Atlántico (Xiphias gladius) por arte y bandera.

| | | | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL | | | 23969 | 24380 | 26266 | 32685 | 34305 | 32976 | 28826 | 29207 | 32868 | 34159 | 38803 | 33511 | 31567 | 26251 | 27123 | 27180 | 25139 | 23758 | 24075 | 25252 | 25643 | 25718 | 27997 | 23551 | 25103 |
| | ATN | | 14383 | 18486 | 20236 | 19513 | 17250 | 15672 | 14934 | 15394 | 16738 | 15581 | 16873 | 15222 | 13025 | 12223 | 11622 | 11453 | 10011 | 9654 | 11442 | 12175 | 12480 | 11473 | 12444 | 11188 | 12655 |
| | ATS | | 9586 | 5894 | 6030 | 13172 | 17055 | 17304 | 13893 | 13813 | 16130 | 18958 | 21930 | 18289 | 18542 | 14027 | 15502 | 15728 | 15128 | 14104 | 12633 | 13077 | 13162 | 14245 | 15553 | 12363 | 12448 |
| Landings | ATN | Longline | 14240 | 18269 | 20022 | 18927 | 15348 | 14026 | 14208 | 14253 | 15641 | 14309 | 15764 | 13808 | 12181 | 10778 | 10449 | 9642 | 8425 | 8664 | 9597 | 11406 | 11527 | 10840 | 11617 | 10473 | 11724 |
| | | Other surf. | 143 | 217 | 214 | 586 | 1902 | 1646 | 511 | 723 | 689 | 484 | 582 | 826 | 393 | 961 | 643 | 672 | 685 | 374 | 822 | 449 | 620 | 409 | 546 | 471 | 780 |
| | ATS | Longline | 8863 | 4951 | 5446 | 12404 | 16398 | 16705 | 13287 | 13176 | 15547 | 17387 | 20806 | 17799 | 18239 | 13748 | 14823 | 15448 | 14302 | 13576 | 11712 | 12485 | 12915 | 12723 | 14890 | 11623 | 12062 |
| | | Other surf. | 723 | 945 | 584 | 768 | 657 | 599 | 606 | 637 | 583 | 1571 | 1124 | 489 | 282 | 269 | 672 | 278 | 825 | 527 | 920 | 591 | 248 | 522 | 572 | 734 | 386 |
| Discards | ATN | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 215 | 383 | 408 | 768 | 526 | 562 | 439 | 476 | 525 | 1137 | 896 | 667 | 618 | 313 | 323 | 215 | 273 | 235 | 145 |
| | | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 12 | 9 | 4 | 1 | 6 | 8 | 5 | 7 | 10 | 8 | 6 | 9 | 6 |
| | ATS | Longline | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 21 | 10 | 6 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 91 | 6 | |
| | | Other surf. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Landings | ATN | Barbados | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 16 | 16 | 12 | 13 | 19 | 10 | 21 | 25 | 44 | 39 | 27 | 39 | 25 |
| | | Belize | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 112 |
| | | Brazil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Canada | 585 | 1059 | 954 | 895 | 1247 | 911 | 1026 | 1547 | 2234 | 1676 | 1616 | 739 | 1089 | 1115 | 1119 | 968 | 1075 | 959 | 1285 | 1203 | 1558 | 1404 | 1348 | 1334 | 1350 |
| | | China P.R. | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 73 | 86 | 104 | 132 | 40 | 337 | 304 | 22 | 102 | 90 | 316 | 56 | 108 | 73 | 65 | 92 | 92 |
| | | Chinese Taipei | 152 | 157 | 52 | 23 | 17 | 270 | 577 | 441 | 127 | 507 | 489 | 521 | 509 | 286 | 285 | 347 | 299 | 310 | 257 | 30 | 140 | 172 | 103 | 82 | 89 |
| | | Cuba | 162 | 636 | 910 | 832 | 87 | 47 | 23 | 27 | 16 | 59 | 86 | 7 | 7 | 7 | 7 | 6 | 0 | 10 | 3 | 3 | 2 | 2 | 0 | 0 | |
| | | Côte D'Ivoire | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 |
| | | Dominica | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Denmark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.España | 7441 | 9719 | 11135 | 9799 | 6648 | 6356 | 6633 | 6672 | 6598 | 6185 | 6953 | 5547 | 5140 | 4079 | 3996 | 4595 | 3968 | 3957 | 4586 | 5376 | 5521 | 5448 | 5564 | 4366 | 4949 |
| | | EU.France | 4 | 4 | 0 | 0 | 0 | 75 | 75 | 75 | 95 | 46 | 84 | 97 | 164 | 110 | 104 | 122 | 0 | 74 | 169 | 102 | 178 | 92 | 46 | 14 | 15 |
| | | EU.Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 15 | 15 | 132 | 81 | 35 | 17 | 5 | 12 | 1 | 1 | 3 | 2 | 2 | 1 |
| | | EU.Netherlands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Poland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | EU.Portugal | 22 | 468 | 992 | 617 | 300 | 475 | 773 | 542 | 1961 | 1599 | 1617 | 1703 | 903 | 773 | 777 | 732 | 735 | 766 | 1032 | 1320 | 900 | 949 | 778 | 747 | 898 |
| | | EU.United Kingdom | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 5 | 11 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | | FR.St Pierre et Miquelon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 3 | 36 | 45 | 0 | 82 | 48 | 17 |
| | | Faroe Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Grenada | 0 | 0 | 0 | 56 | 5 | 1 | 2 | 2 | 13 | 0 | 1 | 4 | 15 | 15 | 42 | 24 | 0 | 54 | 88 | 73 | 56 | 50 | 26 | 43 | |
| | | Ireland | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Japan | 921 | 807 | 415 | 621 | 1572 | 1051 | 992 | 1064 | 1126 | 933 | 1043 | 1494 | 1218 | 1391 | 1089 | 161 | 0 | 0 | 0 | 575 | 705 | 656 | 869 | 935 | 1197 |
| | | Korea Rep. | 160 | 68 | 60 | 30 | 320 | 51 | 5 | 3 | 19 | 16 | 16 | 19 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 65 | 175 | 157 | 3 |
| | | Liberia | 24 | 16 | 30 | 19 | 35 | 9 | 0 | 7 | 14 | 26 | 26 | 28 | 28 | 28 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Libya | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | |
| | | Maroc | 137 | 181 | 157 | 196 | 222 | 91 | 110 | 69 | 39 | 36 | 79 | 462 | 207 | 191 | 119 | 114 | 525 | 223 | 329 | 335 | 334 | 341 | 237 | 430 | 724 |
| | | Mexico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 14 | 0 | 22 | 14 | 28 | 24 | 37 | 27 | 34 | 32 | 44 | 43 | 31 | 35 | 34 | 32 |
| | | NEI (ETRO) | 0 | 0 | 0 | 76 | 112 | 529 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | NEI (MED) | 0 | 14 | 3 | 131 | 190 | 185 | 45 | 35 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Norway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Panama | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Philippines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 44 | 5 | 0 | 5 | 0 | 22 | 28 |
| | | Romania | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Russian Federation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| | | Senegal | 0 | 0 | 0 | 0 | 1 | 0 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 108 | 105 | 0 | 150 | 139 | 223 |
| | | Seychelles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Sierra Leone | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | St. Vincent and Grenadines | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 23 | 0 | 4 | 3 | 1 | 0 | 1 | 0 | 22 | 22 | 7 | 7 | 7 | 0 | 51 | 7 | 34 |

Original: English

*8.9 SWO-MED-MEDITERRANEAN SWORDFISH*

In the last 15 years Mediterranean swordfish production fluctuates without any specific trend at levels higher than those observed for bigger areas such as the North and South Atlantic. The most recent assessment was conducted in 2010, making use of catch and effort information through 2008. The present report summarizes assessment results and readers interested in more detailed information on the state of the stock should consult the report of the latest stock assessment session.

*SWO-MED-1. Biology*

Research results based on genetic studies have demonstrated that Mediterranean swordfish compose a unique stock separated from the Atlantic ones, although there is incomplete information on stock mixing and boundaries. However, mixing between stocks is believed to be low and generally limited to the region around the Straits of Gibraltar.

According to previous knowledge, the Mediterranean swordfish have different biological characteristics compared to the Atlantic stock. The growth parameters are different, and the sexual maturity is reached at younger ages than in the Atlantic, although more recent information for the Atlantic indicates that these differences may smaller than was previously thought. In the Mediterranean, mature females as small as 110 cm LJFL have been observed and the estimated size at which 50% of the female population is mature occurs at about 140 cm. According to the growth curves used by SCRS in the past for Mediterranean swordfish, these two sizes correspond to 2 and 3.5 year-old fish, respectively. Males reach sexual maturity at smaller sizes and mature specimens have been found at about 90 cm LJFL. Based on the fish growth pattern and the assumed natural mortality rate of 0.2, the maximum yield would be obtained through instantaneous fishing at age 6, while current catches are dominated, in terms of number, by fish less than 4 years old.

*SWO-MED-2. Fishery indicators*

Annual catch levels fluctuate between 12,000-16,000 t, in the last 15 years without any specific trend. Those levels are relatively high and similar to those of bigger areas such as the North Atlantic. This could be related to higher recruitment levels in the Mediterranean than in the North Atlantic, different reproduction strategies (larger spawning areas in relation to the area of distribution of the stock) and the lower abundance of large pelagic predators (e.g. sharks) in the Mediterranean. Updated information on Mediterranean swordfish catch by gear type is provided in **SWO-MED-Table 1** and **SWO-MED-Figure 1**. The total 2008 catch was 11,153 t (the 2010 assessment reported 12,164 t, which included some unofficial estimates), a reduction of about 15% when compared with 2007 and also with the most recent years. Catch data for 2009 are incomplete. The biggest producers of swordfish in the Mediterranean Sea in recent years are EC-Italy, Morocco, EC-Spain and EC-Greece. Also, Algeria, EC-Cyprus, EC-Malta, EC-Portugal, Tunisia and Turkey have fisheries targeting swordfish in the Mediterranean. Minor catches of swordfish have also been reported by Albania, Croatia, EC-France, Japan, and Libya. The Committee recognized that there may be additional fleets taking swordfish in the Mediterranean, for example, Egypt, Israel, Lebanon, Monaco and Syria, but the data are not reported to ICCAT or FAO.

Mediterranean swordfish landings showed an upward trend from 1965-1972, stabilized between 1973-1977, and then resumed an upward trend reaching a peak in 1988 (20,365 t; **SWO-MED-Table 1**, **SWO-MED-Figure 1**). The sharp increase between 1983 and 1988 may be partially attributed to improvement in the national systems for collecting catch statistics. Since 1988, the reported landings of swordfish in the Mediterranean Sea have declined fluctuating mostly between 12,000 to 16,000 t.

The main fishing gears used are surface longline and gillnets. Minor catches are also reported from harpoon, trap and recreational fisheries. Surface longlines are used all over the Mediterranean, while gillnets are still used in some areas and there are also countries known to be fishing with gillnets but not reporting their catches. However, following ICCAT recommendations for a general ban of driftnets in the Mediterranean, the gillnet fleet has been decreasing, although the total number of vessels cannot be determined from ICCAT statistics.

Preliminary results of experimental fishing surveys presented during the 2006 SCRS meeting indicated that selectivity of the surface longline targeting swordfish was more affected by the type and size of the bait, the depth of the set and the distance between branch lines rather than the type (circular vs. J-shaped) and the size of the hook. In general, American-style longlines capture less juvenile fish than the traditional Mediterranean longline gear, while a significant reduction of swordfish catches was found when using circle hooks.

A study based on fisheries data from the eastern Mediterranean presented during the 2009 SCRS suggested that there are no major differences in the age selection pattern among American and traditional longlines and confirmed previous findings regarding the higher catch efficiency of the American gear. It has been noted, however, that further studies in other Mediterranean areas are needed to verify that the estimated selection curves are independent of the stock distribution pattern.

Standardised CPUE series from the main longline and gillnet fisheries targeting swordfish, which were presented during the 2010 stock assessment session (Spanish longliners, Italian longliners, Greek longliners and Moroccan gillnetters), did not reveal any trend over time (**SWO-MED-Figure 2**). CPUE series, however, covered only the last 10-20 years and not the full time period of reported landings. Similarly to CPUE, not any trend over the past 20 years was identified regarding the mean fish weight in the catches (**SWO-MED-Figure 3**).

*SWO-MED-3. State of the stocks*

Two forms of assessment (production modelling and age-structured analysis - XSA), indicated that current SSB levels are much lower than those in the early 80's, although not any trend appears in the last 15 years. The extent of the decline differ among models, with the production model suggesting a decline of about 30%, while XSA results indicate that current SSB level is about 1/4 of that in the middle 80's (**SWO-MED-Figure 4**). Results indicate that the fishery underwent a rapid expansion in the late 1980s resulting in Fs and catches above those that could support MSY. Estimates of population status from production modeling indicated that current stock level is slightly lower (~5%) to the optimum needed to achieve the ICCAT Convention objective, but these estimates have a high degree of uncertainty (CV~30%). Additionally, it should be noted that production model biomass estimates are very sensitive to the assumption made about the initial stock biomass ratio. In general, the low contrast in the available catch-effort series affects the reliability of biomass estimates, as well as, the predictions of effort changes on future catch levels.

Results of yield-per-recruit analyses based on the analytical age-structured assessment in which we have more confidence indicated that the stock is in overfished condition and slight overfishing is taking place. Current (2008) SSB is 46% lower than the value that would maximize yield per-recruit. Current F is slightly higher to the estimated $F_{MSY}$ (**SWO-MED-Figure 5**). Note, however, that these conclusions are based on deterministic analyses of the available data. The level of uncertainty in these estimates has not been evaluated.

The Committee again noted the large catches of small size swordfish, i.e., less than 3 years old (many of which have probably never spawned) and the relatively low number of large individuals in the catches. Fish less than three years old usually represent 50-70% of the total yearly catches in terms of numbers and 20-35% in terms of weight (**SWO-MED-Figure 6**). A reduction of the volume of juvenile catches would improve yield per recruit and spawning biomass per recruit levels.

*SWO-MED-4. Outlook*

The assessment of Mediterranean swordfish indicates that the stock is below the level which can support MSY and that current fishing mortality slightly exceeds $F_{MSY}$. Overall results suggest that fishing mortality (and near-term catches) needs to be reduced to move the stock toward the Convention objective of biomass levels which could support MSY and away from levels which could allow a rapid stock decline. A reduction of current F to the $F_{0.1}$ level would result to a substantial (about 40%) long-term increase in SSB (**SWO-MED-Figure 7**).

Seasonal closure projections based on highly-aggregated data derived from the age-structured assessment and which assume no compensation in effort, no interaction with other management actions in place, and an improvement in recruitment with increasing spawning stock biomass (SSB), are forecast to be beneficial in moving the stock condition closer to the Convention objective, resulting in increased catch levels in the medium term, and reductions in the volume of juvenile catches. Although simulations suggest that the stock can be rebuild to the mid-1980s SSB levels only in the case of six month closures, SSB increases up to the optimum levels suggested by the yield-per-recruit analysis can be achieved within 2-3 generations (8-12 years) even under the current management status (2-month closure), provided that fishing mortality is kept on 2008 levels, which were quite lower than the previous years. Risk analysis, however, indicates that a small probability (<5%) of stock collapse still exists in this case. Benefits from seasonal closures would be diminished if closure is applied in months of low fishing activity (December-January). It should be noted that seasonal closures, especially the longer ones, would result in significant catch reductions within the first few years after their application. Capacity reductions of 20% assuming no compensation in effort, or quotas equal to the 80% of the mean yield of the last decade assuming no change in the selection pattern, could also result to stock rebuilt to optimum SSB levels. Results of the seasonal closure projections are summarized in **SWO-MED-Figure 8**.

*SWO-MED-5. Effects of current regulations*

ICCAT imposed a Mediterranean-wide one month fishery closure for all gears targeting swordfish in 2008, followed by a two-month closure since 2009. Several countries have imposed technical measures, such as closed areas and seasons, minimum landing size regulations and license control systems. The EC introduced a driftnet ban in 2002 and in 2003 ICCAT adopted a recommendation for a general ban of this gear in the Mediterranean [Rec. 03-04]. Rec. 04-12 forbids the use of various types of nets and longlines for sport and recreational fishing for tuna and tuna-like species in the Mediterranean.

In past meetings, the Committee has reviewed the various measures taken by member countries and noted the difficulties in implementing some of the management measures, particularly that of minimum landing size.

*SWO-MED-6. Management recommendations*

The Commission should adopt a Mediterranean swordfish fishery management plan which ensures that the stock will be rebuilt and kept in levels that are consistent with the ICCAT Convention objective. Given the uncertainties on optimum SSB level estimates and the rapid fishery expansion in the 80's, which resulted in severe stock biomass declines, the SSB levels in the late 80's may be also considered as a good proxy for the stock. These levels, are around to 60000-70000 t, not very far however, from the currently estimated $B_{MSY}$ value (~62000 t). Analysis has suggested that the seasonal closures have beneficial effects and can move the stock condition to the level which will support MSY, but the effect of the recently employed two-month closure could not be evaluated due to incomplete 2009 data.

Following the results from recent studies (SCRS/2006/163), technical modifications of the longline fishing gears, as well as, the way they are operated can be considered as an additional technical measure in order to reduce the catch of juveniles. The Committee recommends this type of measures be considered as part of a Mediterranean swordfish management plan. Given that the current capacity in the Mediterranean swordfish fishery exceeds that needed to efficiently extract MSY, management measures aimed at reducing this capacity should also be considered part of a Mediterranean swordfish management plan adopted by the Commission.

## MEDITERRANEAN SWORDFISH SUMMARY

| | |
|---|---|
| Maximum Sustainable Yield | ~14,600 [1] |
| Current (2008) Yield [2] | 12,164 t |
| Current (2008) Replacement Yield | ~12,100 t[1] |
| Relative Biomass ($B_{2008}/B_{MSY}$) | 0.54 [1] |
| Relative Fishing Mortality | |
| $F_{2008}/F_{MSY}$ | 1.03 [1] |
| $F_{2008}/F_{MAX}$ | 0.91[1] |
| $F_{2008}/F_{0.1}$ | 1.52 [1] |
| $F_{2008}/F_{30\%SPR}$ | 1.32 [1] |
| Management measures in effect | Driftnet ban [Rec. 03-04] |
| | Two month fishery closure [3] |

[1] Based on the age-structured analysis.
[2] The 2009 reported catch is considered incomplete and too provisional to use in this table.
(..)
[3] Various technical measures, such as closed areas, minimum size regulations and effort controls are implemented at the national level.

### *8.10 SBF – SOUTHERN BLUEFIN TUNA*

The Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is charged with assessing the status of southern bluefin tuna. Each year, SCRS reviews the CCSBT reports to learn about southern bluefin research and stock assessments. These reports are available from CCSBT.

Original: English

*8.11 SMT - SMALL TUNAS*

*SMT-1. Generalities*

Small tunas include the following species:

- BLF Blackfin tuna (*Thunnus atlanticus*)
- BLT Bullet tuna (*Auxis rochei*)
- BON Atlantic bonito (*Sarda sarda*)
- BOP Plain bonito (*Orcynopsis unicolor*)
- BRS Serra Spanish mackerel (*Scomberomorus brasiliensis*)
- CER Cero (*Scomberomorus regalis*)
- FRI Frigate tuna (*Auxis thazard*)
- KGM King mackerel (*Scomberomorus cavalla*)
- KGX Scomberomorus unclassified (*Scomberomorus spp.*)
- LTA Little tunny (*Euthynnus alletteratus*)
- MAW West African Spanish mackerel (*Scomberomorus tritor*)
- SSM Atlantic Spanish mackerel (*Scomberomorus maculatus*)
- WAH Wahoo (*Acanthocybium solandri*)

Knowledge on the biology and fishery of small tunas is very fragmented in several areas. Furthermore, the quality of the knowledge is very different according to the species concerned. This is due in large part because many of these species are often perceived to have little economic importance compared to other tuna and tuna-like species, and owing to the difficulties in conducting sampling of the landings from artisanal fisheries, which constitute a high proportion of the fisheries exploiting small tuna resources. The large industrial fleets often discard small tuna catches at sea or sell them on local markets mixed with other by-catches, especially in Africa (SCRS/2009/147). The amount caught is rarely reported in logbooks, however observer programs from purse seine fleets have recently provided estimates of catches of small tunas (SCRS/2009/146).

Small tuna species have a very high relevance from a socio-economic point of view, because they are important for many coastal communities in all areas and are a main source of food. The socio-economic value is often not evident because of the underestimation of the total figures, due to the above mentioned difficulties in data collection. Several statistical problems are also caused by misidentification and some of them were faced and discussed during this Small Tunas Species Group meeting. The small tuna species can reach high levels of catches and value in some years.

Scientific collaboration among ICCAT, RFOs and countries in the various regions is imperative to advance understanding of the distribution, biology and fishery of these species.

*SMT-2. Biology*

These species are widely distributed in the tropical and subtropical waters of the Atlantic Ocean and several are also distributed in the Mediterranean Sea and the Black Sea. Some species extend their range even to colder waters, like the North and South Atlantic Ocean. They often form large schools with other small sized tunas or related species in coastal and high seas waters.

Generally, the small tuna species have a varied diet with a preference for small pelagics (e.g., clupeids, mullets, carangids, etc.), crustaceans, mollusks and cephalopods. Many of these species are also prey of large tunas, marlins and sharks. The reproduction period varies according to species and spawning generally takes place near the coast in oceanic areas, where the waters are warmer. The growth rate currently estimated for these species is very rapid for the first two or three years, and then slows as these species reach size-at-first maturity. Studies about the migration patterns of small tuna species are very rarely available, due to the practical difficulties in manipulating and tagging these species.

New information regarding the reproductive biology of Atlantic bonito (*Sarda sarda*) and wahoo (*Acanthocybium solandri*) was submitted to the Group. In addition, information regarding wahoo and slender tuna (*Allothunnus fallai*) as by-catch species of the Brazilian longline fishery and Brazilian artisanal beach seine fishery, respectively, was also reported.

Although there is a general lack of information on biological parameters for these species, the need for information is especially critical for West Africa and the Caribbean and South America.

The small tuna species identification sheets have already been completed and are available from the Secretariat.

*SMT-3. Description of the fisheries*

Small tunas are exploited mainly by coastal fisheries and artisanal fisheries, although substantial catches are also made as target species and as by-catch by purse seine, mid-water trawlers (i.e., pelagic fisheries of West Africa-Mauritania), handline and small scale gillnets. Unknown quantities of small tuna also comprise the incidental catches of some longline fisheries. The increasing importance of FAD fisheries in the eastern Caribbean and in other areas has improved the efficiency of artisanal fisheries in catching small tunas. Various species are also caught by the sport and recreational fisheries.

Despite of the scarce monitoring of various fishing activities in some areas, all the small tuna fisheries have a high socio-economic relevance for most of the coastal countries concerned and for many local communities, particularly in the Mediterranean Sea, in the Caribbean region and in West Africa.

**SMT-Table 1** shows historical landings of small tunas for the 1980 to 2009 period although data for last year are preliminary. This table does not include species reported as "mixed" or "unidentified", as was the case in previous years, since these categories include large tuna species. There are more than 10 species of small tunas, but only five of these account for about 88% of the total reported catch by weight. These five species are: Atlantic bonito *(Sarda sarda)*, frigate tuna *(Auxis thazard)* which may include some catches of bullet tuna *(Auxis rochei)*, little tunny *(Euthynnus alletteratus)*, king mackerel *(Scomberomorus cavalla)*, and Atlantic Spanish mackerel *(Scomberomorus maculatus)* (**SMT-Figure 2**). In 1980, there was a marked increase in reported landings compared to previous years, reaching a peak of about 147,202 t in 1988 (**SMT-Figure 1**). Reported landings for the 1989-1995 period decreased to approximately 91,907 t, and then an oscillation in the values in the following years, with a minimum of 72,460 t in 2003 and a maximum of 129,353 t in 2005. Overall trends in the small tuna catch may mask declining trends for individual species because annual landings are often dominated by the landings of a single species. These fluctuations seem to be related to unreported catches, as these species generally comprise part of the by-catch and are often discarded, and therefore do not reflect the real catch.

A preliminary estimate of the total nominal landings of small tunas in 2009 is 50,873 t. The Small Tunas Species Group pointed out the relative importance of small tuna fisheries in the Mediterranean and the Black Sea, which account for about 28% of the total reported catch in the ICCAT area for the period 1980-2008.

Despite the recent improvements in the statistical information provided to ICCAT by several countries, either with the provision of Task I data or with information provided by national scientists during the Small Tunas Species Group meeting, the Committee also noted that uncertainties remain regarding the accuracy and completeness of reported landings in all areas. There is a general lack of information on the mortality of these species as by-catch, exacerbated by the confusion regarding species identification.

*SMT-4. State of the stocks*

There is little information available to determine the stock structure of many small tuna species. The Committee suggests that countries be requested to submit all available data to ICCAT as soon as possible, in order to be used in future meetings of the Committee.

Generally, current information does not allow the Committee to carry out an assessment of stock status of the majority of the species. Some analyses will be possible in future if data availability improves with the same trend of the latest year. Nevertheless, few regional assessments have been carried out. Assessments of stocks of small tunas are also important because of their position in the trophic chain where they are the prey of large tunas, marlins and sharks and they are predators of smaller pelagic. It may therefore be best to approach assessments of small tunas from the ecosystem perspective.

*SMT-5. Outlook*

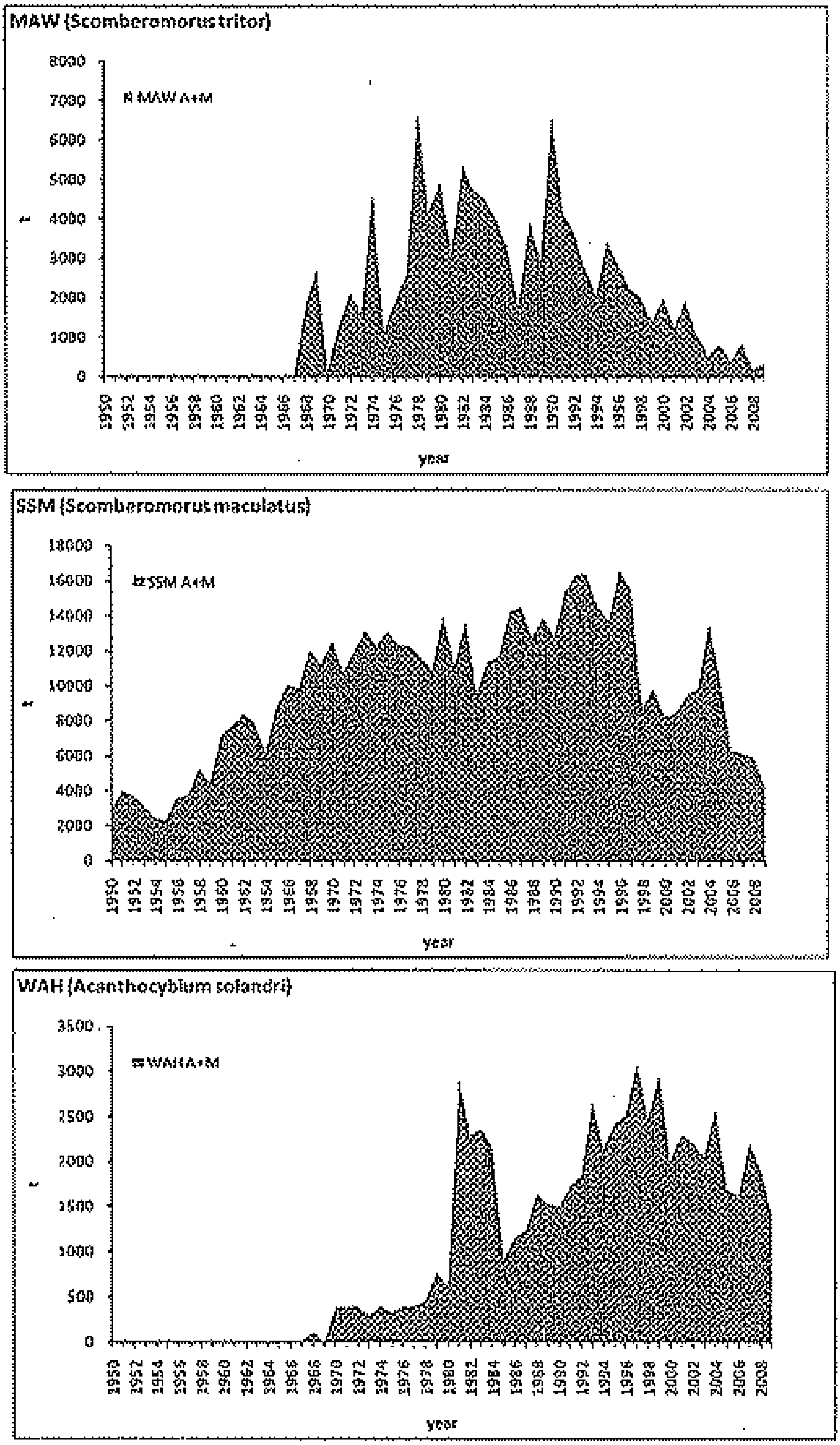
There is an improvement in the availability of catch and biological data for small tuna species particularly in the Mediterranean and the Black Sea. However, biological information, catch and effort statistics for small tunas remain incomplete for many of the coastal and industrial fishing countries. Given that, many of these species are of high importance to coastal fishermen, especially in some developing countries, both economically and often as a primary source of protein, therefore the Committee recommends that further studies be conducted on small tuna species due to the small amount of information available.

*SMT-6. Effects of current regulations*

There are no ICCAT regulations in effect for small tunas. Several regional and national regulations are in place.

*SMT-7. Management recommendations*

No management recommendations have been made.




SMT-Figure 2. Estimated landings (t) of the major species of small tunas in the Atlantic and Mediterranean, 1950-2009. The data for the last years are incomplete.

**Original: English**

*8.12 SHK - SHARKS*

In response to the *Supplemental Recommendation by ICCAT Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT* [Rec. 06-10], an updated assessment of the stocks of *blue shark (Prionace glauca)* and *shortfin mako (Isurus oxyrinchus) was conducted in 2008.* Ecological risk assessments (ERA) were also conducted for nine additional priority species of pelagic elasmobranchs, for which available data are very limited (*Isurus paucus, Alopias superciliosus, Alopias vulpinus, Carcharhinus longimanus, C. falciformis, Lamna nasus, Sphyrna lewini, Sphyrna zygaena,* and *Pteroplatytrygon violacea*). In 2009, an assessment of porbeagle stocks was conducted jointly with ICES, in response to the *Resolution by ICCAT on Porbeagle Shark* [Rec. 08-08].

The quantity and quality of the data available (e.g., historical catches and CPUE information) to conduct stock assessments have increased with respect to those available in the first (2004) shark assessments (Anon. 2005c) conducted by ICCAT. However, they are still quite uninformative and do not provide a consistent signal to inform the assessment. Unless these and other issues can be resolved, the assessments of stock status for all pelagic shark species will continue to be very uncertain and our ability to detect stock depletion to levels below the Convention Objective level will remain considerably low.

A summary of the Committee's findings based on the 2008 (Anon. 2009c) and 2009 (SCRS/2009/014) assessment results is presented below. Although pelagic sharks are captured in the Atlantic Ocean with a wide variety of fishing gears, the largest volume of most of the species of major concern to ICCAT are captured by pelagic longline fisheries.

The Committee assessed blue and shortfin mako sharks in 2008 assuming the existence of three separate stocks: North, South and Mediterranean. However, the data available to the Committee for the Mediterranean were not considered sufficient to conduct quantitative assessments for these species. The assessment results presented high levels of uncertainty due to data limitations. Similarly, the Committee assessed in 2009 porbeagle sharks assuming the existence of four separate stocks: Northwest, Northeast (including the Mediterranean, for which only limited information is available), Southwest and Southeast. The assessment results for the southern porbeagle stocks also presented high levels of uncertainty due to data limitations.

Increased research and data collection are required to enable the Committee to improve the advice it can offer.

*SHK-1. Biology*

A great variety of shark species are found within the ICCAT Convention area, from coastal to oceanic species. Biological strategies of these sharks are very diverse and are adapted to the needs within their respective ecosystems where they occupy a very high position in the trophic chain as active predators. Therefore, generalization as regards to the biology of these very diverse species results in inevitable inaccuracies, as would occur for teleosts. To date, ICCAT has prioritized the biological study and assessment of the major sharks of the epipelagic system as these species are more susceptible of being caught as by-catch by oceanic fleets targeting tuna and tuna-like species. Among these shark species there are some of special prevalence and with an extensive geographical distribution within the oceanic-epipelagic ecosystem, such as the blue shark and shortfin mako shark, and others with less or even limited prevalence, such as porbeagle, hammerhead sharks, thresher sharks, white sharks, etc.

Blue shark and shortfin mako sharks show a wide geographical distribution, most often between 50°N and 50°S latitude. On the contrary, porbeagle show a distribution that is restricted to cold-temperate waters, preferably close to the continental shelf of both hemispheres where this species rarely overlaps with the fishing activity directed at tunas and tuna-like species. These three species have an ovoviviparous reproductive strategy, which increases the probability of survival of their young, with litters from only a few individuals in the case of shortfin mako and porbeagle, to abundant litters of about 40 pups in the case of blue shark. Their growth rates differ between sexes and among these three species. Females often reach first maturity at a large size. A characteristic of these species is usually their tendency to segregate temporally and spatially by size-sex, according to their respective processes of feeding, mating-reproduction, gestation and birth. Numerous aspects of the biology of these species are still poorly understood or completely unknown, particularly for some regions, which contributes to increased uncertainty in quantitative and qualitative assessments.

*SHK-2. Fishery indicators*

Earlier reviews of the shark database resulted in recommendations to improve data reporting on shark catches. Though global statistics on shark catches included in the database have improved, they are still insufficient to permit the Committee to provide quantitative advice on stock status with sufficient precision to guide fishery management toward optimal harvest levels. Reported catches for blue shark, shortfin mako and porbeagle are provided in **SHK-Table 1**. Given that catch reports to ICCAT are incomplete, the Committee attempted to develop a more accurate estimate of shark mortality and capture related to the Atlantic tuna fleets on the basis of the expected proportions among tunas and sharks and in the landings of these fleets (**SHK-Figure 1 to 4**) as well as using shark fin trade data. These information sets were used to reconstruct plausible estimates of historic catches used in blue shark and shortfin mako assessments in 2008 and porbeagle in 2009.

A number of standardized CPUE data series for blue shark and shortfin mako were presented in 2008 as relative indices of abundance. The Committee placed emphasis on using the series that pertained to fisheries that operate in oceanic waters over wide areas. **SHK-Figure 5** presents the central tendency of the available series for the four stocks of these species.

Considering the quantitative and qualitative limitations of the information available to the Committee, the results presented in 2008, as those of the 2004 assessment (Anon. 2005c), are not conclusive. During the porbeagle assessment in 2009 (SCRS/2009/014), standardized CPUE data were presented for three of the four stocks (NE, NW and SW; **SHK-Figure 6**). These series when referring to fisheries targeting porbeagle could fail to reflect the global abundance of the stock and where they refer to sharks caught as by-catch they could be highly variable.

With regard to the species for which ERAs were conducted, the Committee understands that, in spite of existing uncertainties, results make it possible to identify those species that are more susceptible and vulnerable (based only on productivity) to prioritize research and management measures (**SHK-Table 2**). These ERAs are conditional on the biological variables used to estimate productivity as well as the susceptibility values for the different fleets and thus may change in the future as new information becomes available.

*SHK-3. State of the Stocks*

Ecological risk assessments for eleven priority species of sharks (including *blue shark and shortfin mako*) caught in ICCAT fisheries demonstrated that most Atlantic pelagic sharks have exceptionally limited biological productivity and, as such, can be overfished even at very low levels of fishing mortality. Specifically, the analyses indicated that bigeye threshers, longfin makos, and shortfin makos have the highest vulnerability (and lowest biological productivity) of the shark species examined (with bigeye thresher being substantially less productive than the other species). All species considered in the ERA, particularly smooth hammerhead, longfin mako, bigeye thresher and crocodile sharks, are in need of improved biological data to evaluate their biological productivity more accurately and thus specific research projects should be supported to that end. **SHK-Table 2** provides a productivity ranking of the species considered. ERAs should be updated with improved information on the productivity and susceptibility of these species.

*SHK-3.1 Blue shark*

For both North and South Atlantic blue shark stocks, although the results are highly uncertain, biomass is believed to be above the biomass that would support MSY and current harvest levels below $F_{MSY}$. Results from all models used in the 2008 assessment (Anon. 2009c) were conditional on the assumptions made (*e.g.*, estimates of historical catches and effort, the relationship between catch rates and abundance, the initial state of the stock in the 1950s, and various life-history parameters), and a full evaluation of the sensitivity of results to these assumptions was not possible during the assessment. Nonetheless, as for the 2004 stock assessment (Anon. 2005c), the weight of available evidence does not support hypotheses that fishing has yet resulted in depletion to levels below the Convention objective (**SHK-Figure 7**).

*SHK-3.2 Shortfin mako shark*

Estimates of stock status for the North Atlantic shortfin mako obtained with the different modeling approaches applied in 2008 were much more variable than for blue shark. For the North Atlantic, most model outcomes indicated stock depletion to about 50% of biomass estimated for the 1950s. Some model outcomes indicated that the stock biomass was near or below the biomass that would support MSY with current harvest levels above $F_{MSY}$, whereas others estimated considerably lower levels of depletion and no overfishing (**SHK-Figure 7**). In light of the biological information that indicates the point at which $B_{MSY}$ is reached with respect of the carrying capacity which occurs at levels higher than for blue sharks and many teleost stocks. There is a non-negligible probability that the North Atlantic shortfin mako stock could be below the biomass that could support MSY. A similar conclusion was reached by the Committee in 2004, and recent biological data show decreased productivity for this species. Only one modeling approach could be applied to the South Atlantic shortfin mako stock, which resulted in an estimate of unfished biomass which was biologically implausible, and thus the Committee can draw no conclusions about the status of the South stock.

*SHK-3.3 Porbeagle shark*

In 2009, the Committee attempted an assessment of the four porbeagle stocks in the Atlantic Ocean: Northwest, Northeast, Southwest and Southeast. In general, data for southern hemisphere porbeagle are too limited to provide a robust indication on the status of the stocks. For the Southwest, limited data indicate a decline in CPUE in the Uruguayan fleet, with models suggesting a potential decline in porbeagle abundance to levels below MSY and fishing mortality rates above those producing MSY (**SHK-Figure 8**). But catch and other data are generally too limited to allow definition of sustainable harvest levels. Catch reconstruction indicates that reported landings grossly underestimate actual landings. For the Southeast, information and data are too limited to assess their status. Available catch rate patterns suggest stability since the early 1990s, but this trend cannot be viewed in a longer term context and thus are not informative on current levels relative to $B_{MSY}$.

The northeast Atlantic stock has the longest history of commercial exploitation. A lack of CPUE data for the peak of the fishery adds considerable uncertainty in identifying the current status relative to virgin biomass. Exploratory assessments indicate that current biomass is below $B_{MSY}$ and that recent fishing mortality is near or above $F_{MSY}$ (**SHK-Figure 9**). Recovery of this stock to $B_{MSY}$ under no fishing mortality is estimated to take ca. 15-34 years. The current EU TAC of 436 t in effect for the Northeast Atlantic may allow the stock to remain stable, at its current depleted biomass level, under most credible model scenarios. Catches close to the current TAC (e.g. 400 t) could allow rebuilding to $B_{MSY}$ under some model scenarios, but with a high degree of uncertainty and on a time scale of 60 (40-124) years.

An update of the Canadian assessment of the northwest Atlantic porbeagle stock indicated that biomass is depleted to well below $B_{MSY}$, but recent fishing mortality is below $F_{MSY}$ and recent biomass appears to be increasing. Additional modelling using a surplus production approach indicated a similar view of stock status, i.e., depletion to levels below $B_{MSY}$ and current fishing mortality rates also below $F_{MSY}$ (**SHK-Figure 10**). The Canadian assessment projected that with no fishing mortality, the stock could rebuild to $B_{MSY}$ level in approximately 20-60 years, whereas surplus-production based projections indicated 20 years would suffice. Under the Canadian strategy of a 4% exploitation rate, the stock is expected to recover in 30 to 100+ years according to the Canadian projections.

***SHK-4. Management Recommendations***

Precautionary management measures should be considered for stocks where there is the greatest biological vulnerability and conservation concern, and for which there are very few data. Management measures should ideally be species-specific whenever possible.

For species of high concern (in terms of overfishing), and for which a high survivorship is expected in fishing gears after release, the Committee recommends that the Commission prohibits retention and landings of the species to minimize fishing mortality. The Committee recognizes that the difficulty in identifying look-alike species may complicate compliance with management measures adopted for those species

For all the species, but particularly for those which can be easily misidentified, it is essential that the Committee advances data collection, and research on life history, together with the interactions with tuna fisheries, with the final objective of assessing the status of the stocks. Until such information is made available, the Commission should take consider effective measures to reduce the fishing mortality of these stocks. These measures may include minimum or maximum size limits for landing (for protection of juveniles or the breeding stock, respectively); and any other technical mitigation measures such as gear modifications, time-area restrictions, or others as appropriate. Such management actions should be combined with research activities, in order to provide information of their effectiveness.

Both porbeagle stocks in the NW and NE Atlantic were estimated to be overfished, with the northeastern stock being more highly depleted. The main source of fishing mortality on these stocks is from directed porbeagle fisheries which are not under the Commission's direct mandate. Those fisheries are managed mostly by ICCAT Contracting Parties through national legislation which include quotas and other management measures.

The Committee also recommends that countries initiate research projects to investigate means to minimize by-catch and discard mortality of sharks, with a particular view to recommending to the Commission complementary measures to minimize porbeagle by-catch in fisheries for tuna and tuna-like species. For porbeagle sharks, the Committee recommends that the Commission work with countries catching porbeagle, particularly those with targeted fisheries, and relevant RFMOs to ensure recovery of North Atlantic porbeagle stocks and prevent overexploitation of South Atlantic stocks. In particular, porbeagle fishing mortality should be kept to levels in line with scientific advice and with catches not exceeding current level. New targeted porbeagle fisheries should be prevented, porbeagles retrieved alive should be released alive, and all catches should be reported. Management measures and data collection should be harmonized as much as possible among all relevant RFMOs dealing with these stocks, ICCAT should facilitate appropriate communication.

The Committee recommends that joint work with the ICES Working Group on Elasmobranch Fishes should be continued. In light of the changing methods in the provision of ICES advice, from the Precautionary Approach to $F_{MSY}$, the 2009 joint ICCAT/ICES porbeagle (*Lamna nasus*) assessment should be revisited. Representatives of the Committee should attend the 2011 WGEF meeting (Copenhagen, June 2011), to update the NE Atlantic porbeagle assessment with recent data, in preparation for a full assessment in 2012. In addition, stocks of mutual interest and areas of overlap, particularly species occurring in the Mediterranean Sea, should be discussed.

Considering that (a) the oceanic whitetip shark (*Carcharhinus longimanus*), as in the case of bigeye thresher (*Alopias superciliosus*), has been ranked as one of the five species with the highest degree of risk in an ecological risk assessment performed by the SCRS in 2008 for sharks, due to the lack of the provision of data; (b) that it has high at-vessel survival and constitutes a small portion of the shark catch; (c) that it is one of the easiest shark species to identify, particularly by their characteristic fins; and (d) that a significant proportion of the species catch is composed of juvenile individuals; the group recommends invocation of a precautionary approach in suggesting a minimum size in total length be established for the species. Therefore, the Committee recommends the adoption of a minimum size of 200 cm total length which would allow protection of the first reproductive ages. The Committee further recommends that research be conducted to better determine what life stages are more important for the productivity of the stock.

The Committee should conduct a Data Preparatory Meeting in 2011 with the purpose of generating a larger and better database to update in 2012 the Ecological Risk Assessment conducted in 2008. To that end, national scientists should assemble and present all available information on fisheries operations and pelagic shark life history. Of special interest is any information on fisheries operations gathered by national observer programs related to overlap of fisheries with geographic distribution of pelagic sharks, overlap of gear with vertical distribution of individual species (particularly information collected with satellite tags), as well as status, disposition and size of animals brought to the vessel.

## NORTH ATLANTIC BLUE SHARK SUMMARY

| | | |
|---|---|---|
| 2007 Yield | | 61,845 t[1] |
| Current Yield (2008) | | 30,545 t[2] |
| Relative Biomass: | $B_{2007}/B_{MSY}$ | 1.87-2.74[3] |
| | $B_{2007}/B_0$ | 0.67-0.93[4] |
| Relative Fishing Mortality: | $F_{MSY}$ | 0.15[5] |
| | $F_{2007}/F_{MSY}$ | 0.13-0.17[6] |

[1] Estimated catch used in the 2008 assessments.
[2] Task I catch.
[3] Range obtained from the Bayesian Surplus Production (BSP) (low) and the Catch-Free Age Structured Production (CFASP) (high) models. Value from CFASP is $SSB/SSB_{MSY}$.
[4] Range obtained from BSP (high), CFASP and Age-Structured Production Model (ASPM) (low) models.
[5] From BSP and CFASP models (same value). CV is from CFASP model.
[6] Range obtained from BSP (high) and CFASP (low) models.

## SOUTH ATLANTIC BLUE SHARK SUMMARY

| | | |
|---|---|---|
| 2007 Yield | | 37,075 t[1] |
| Current Yield (2008) | | 23,278 t[2] |
| Relative Biomass: | $B_{2007}/B_{MSY}$ | 1.95-2.80[3] |
| | $B_{2007}/B_0$ | 0.86-0.98[4] |
| Relative Fishing Mortality: | $F_{MSY}$ | 0.15-0.20[5] |
| | $F_{2007}/F_{MSY}$ | 0.04-0.09[6] |

[1] Estimated catch used in the 2008 assessments.
[2] Task I catch.
[3] Range obtained from BSP (low) and CFASP (high) models. Value from CFASP is $SSB/SSB_{MSY}$.
[4] Range obtained from BSP (high) and CFASP (low) models. Value from CFASP is $SSB/SS_{B0}$.
[5] Range obtained from BSP (low) and CFASP (high) models.
[6] Range obtained from BSP (low) and CFASP (high) models.

## NORTH ATLANTIC SHORTFIN MAKO SUMMARY

| | | |
|---|---|---|
| 2007 Yield | | 5,996 t[1] |
| Current Yield (2008) | | 3,372 t[2] |
| Relative Biomass: | $B_{2007}/B_{MSY}$ | 0.95-1.65[3] |
| | $B_{2007}/B_0$ | 0.47-0.73[4] |
| Relative Fishing Mortality: | $F_{MSY}$ | 0.007-0.05[5] |
| | $F_{2007}/F_{MSY}$ | 0.48-3.77[6] |
| Management measures in effect | | [Rec. 04-10], [Rec. 07-06] |

[1] Estimated catch used in the 2008 assessments.
[2] Task I catch.
[3] Range obtained from BSP (low) and CFASP (high) models. Value from CFASP is $SSB/SSB_{MSY}$.
[4] Range obtained from BSP (low), AS, and CFASP (high) models. Value from CFASP is $SSB/SS_{B0}$.
[5] Range obtained from BSP (low) and CFASP (high) models.
[6] Range obtained from BSP (high) and CFASP (low) models.

## NORTHWEST ATLANTIC PORBEAGLE SUMMARY

| | | |
|---|---|---|
| Current Yield (2008) | | 144.3 t[1] |
| Relative Biomass: | $B_{2008}/B_{MSY}$ | 0.43-0.65[2] |
| Relative Fishing Mortality: | $F_{MSY}$ | 0.025-0.075[3] |
| | $F_{2008}/F_{MSY}$ | 0.03-0.36[4] |
| Management measures in effect | | TAC of 185, 11.3 t[5] |

[1] Estimated catch allocated to the Northwest stock area.
[2] Range obtained from age-structured model (Canadian assessment; low) and BSP model (high). Value from Canadian assessment is in numbers; value from BSP in biomass. All values in parentheses are CVs.
[3] Range obtained from BSP model (low) and age-structured model (high).
[4] Range obtained from BSP model (low) and age-structured model (high).
[5] The TAC for the Canadian EEZ is 185 t (MSY catch is 250 t); the TAC for the USA is 11.3 t.

## SOUTHWEST ATLANTIC PORBEAGLE SUMMARY

| | | |
|---|---|---|
| Current Yield (2008) | | 164.6 t[1] |
| Relative Biomass: | $B_{2008}/B_{MSY}$ | 0.36-0.78[2] |
| Relative Fishing Mortality: | $F_{MSY}$ | 0.025-0.033[3] |
| | $F_{2008}/F_{MSY}$ | 0.31-10.78[4] |
| Management measures in effect | | None |

[1] Estimated catch allocated to the Southwest stock area.
[2] Range obtained from BSP (low and high) and CFASP models. Value from CFASP model ($SSB/SSB_{MSY}$) was 0.48 (0.20).
[3] Range obtained from BSP (low) and CFASP (high) models.
[4] Range obtained from BSP (low and high) and CFASP models. Value from CFASP model was 1.72 (0.51).

## NORTHEAST ATLANTIC PORBEAGLE SUMMARY

| | | |
|---|---|---|
| Current Yield (2008) | | 287 t[1] |
| Relative Biomass: | $B_{2008}/B_{MSY}$ | 0.09-1.93[2] |
| Relative Fishing Mortality: | $F_{MSY}$ | 0.02-0.03[3] |
| | $F_{2008}/F_{MSY}$ | 0.04-3.45[4] |
| Management measures in effect | | TAC of 436 t[5]<br>Maximum landing length of 210 cm FL[5] |

[1] Estimated catch allocated to the Northeast stock area.
[2] Range obtained from BSP (high) and ASPM (low) models. Value from ASPM model is $SSB/SSB_{MSY}$. The value of 1.93 from the BSP corresponds to a biologically unrealistic scenario; all results from the other BSP scenarios ranged from 0.29 to 1.05.
[3] Range obtained from the BSP and ASPM models (low and high for both models).
[4] Range obtained from BSP (low) and ASPM (high) models. The value of 0.04 from the BSP corresponds to a biologically unrealistic scenario; all results from the BSP scenarios ranged from 0.70 to 1.26.
[5] In the European Union.

## 9. Report of inter-sessional meetings

The reports of the inter-sessional meetings held in 2010 were presented, with special emphasis not directly related to the stock assessments because their results are not included and presented in the Executive Summaries. The following meetings were presented.

### *9.1 Working Group on Stock Assessment Methods*

The main term of reference of the Working Group was to advise the Commission how the precautionary approach could be best expressed in the ICCAT Convention. As well as suggesting changes to the Convention text in order to incorporate the precautionary approach the Group recommended harmonisation of estimation procedures and produced guidelines for the application of the Kobe II strategy matrix. It was recommended that all Species Groups construct a Kobe II Strategy Matrix (K2SM) and should clearly document how the matrix was constructed.

*Discussion*

The subsequent discussion recognised the importance of socio-economics although it was also noted that the capacity within the SCRS for this type of work still lagged behind that for stock assessment. In response to a Recommendation related to simulation testing of methods used for standardisation of CPUE the importance of understanding the operational changes in fisheries over time was emphasised.

*Future plans*

Suggested future plans for the Group include (1) conducting Meta-analysis for investigation of key parameters (e.g. steepness) in order to reduce uncertainty, assess parameter influence on assessment outputs and improve estimates. (2) The Group plans to conduct investigation into thresholds, reference points, and the use of HCRs to manage risk of exceeding key reference points. (3) Important issues raised during the 2010 meeting have resulted in the need to investigate plus-group dynamics and the implications of different calculations and assumption and (4) to investigate techniques to weight assessment models for those cases where the outputs of more than one model are combined to provide advice. (5) Lastly the Group would like to conduct some preliminary investigations into Ecosystem models in terms of data requirements as well as suitable models for use by the Commission working groups.

Document SCRS/2010/010 contains the detailed report of the meeting.

### *9.2 Bigeye Data Preparatory Meeting*

The Tropical Tuna Working group met two months before the assessment to prepare the data necessary for the population analyses. The meeting had the dual purpose of preparing the general basic fishery data, such as estimates of total harvest and relative abundance estimates, and the highly specific data required to support the use of statistically-based age-structured population models (MULTIFAN-CL and SS3). The later require far more time for preparation of inputs than the VPA and production models, time that would not have been available during the assessment meeting.

The data preparatory meeting achieved its main goals: in addition to obtaining estimates of harvest the majority of the data required for inputs for statistically-based age-structured population models was developed during the data preparatory meeting.

The detailed report of the meeting is presented as document SCRS/2010/011.

*Discussion*

The SCRS acknowledges the comprehensive analyses and presentation regarding the bigeye evaluation during 2010. It was noted, that the use of multiple models for evaluation provide a better view of the levels of uncertainty of the overall assessment. The Chair of the Working Group reflected on the advantages and limitations of having a data preparatory meeting and an assessment meeting. It was noted that the implementation of complex models such Catch Statistical Models require a large effort in data preparation and integration between scientist and the Secretariat, as well sufficient time to run alternative models which are not possible in a single meeting.

It was question how to integrate the results of different models into provide advice to the Commission from the evaluation exercise. The chair noted that advice incorporated both the combination of models particularly for informing on uncertainty levels, as expressed in probability outcomes such the Kobe plot and the Kobe II matrix types, while the median or point estimates were derived from the model used in prior evaluations following a consistent measure of reference for continuity purposes.

*9.3 Blue Marlin Data Preparatory Meeting*

A Blue marlin Data Preparatory Meeting was held in Madrid, May 17 to 21, 2010 to review and update basic information, review and compile new biological and habitat information, review catch reports, and update relative abundance indices for Atlantic blue marlin. Analysis of basic information (T1NC, T1FC, T2CE, and T2SZ) was carried out by the Working Group, revisions and new data reported during the meeting were incorporated into the ICCAT database. Size information was analyzed in detail for its potential use in integrated assessment models and its potential for a future creation of a catch-at-size/age estimation to be used in structured type models. New information on the estimation of age structure and growth of blue marlin was presented. In addition, a new research on the impact of the oxygen minimum zone (OMZ) in the eastern tropical Atlantic on the vertical habitat use of blue marlin provided new insights on its vulnerability to surface gears and the potential variation in catchability inside and outside the OMZ. Analysis of reported catches generated new estimates of total catch for the stock. These analyses included disaggregation of catches reported such as unclassified billfish and filling the gaps of the time series for fleets that had incomplete historical reports. Several relative abundance indices were presented at the meeting including updates of the Brazilian longline, United States. recreational and longline, and Venezuelan small scale, longline, and recreational fisheries; three additional indices were generated for Japan, Chinese Taipei and Korea during the meeting in which the standardization included a binomial factor based on the OMZ in the Atlantic (i.e., inside versus outside the OMZ).

This review provided enough information to support the goal of assessing blue marlin during a meeting in 2011.

Document SCRS/2010/012 contains the detailed report of the meeting. No discussion points were raised during the plenary.

*9.4 Inter-sessional Meeting of the Sub-Committee on Ecosystems*

The report of the inter-sessional meeting held in Madrid between May 31 and June 4 was revised by the Group. Main Agenda items (items 2 to 6) included the revision of the new information available on ecosystems, the optimum observer coverage for reliable estimates of by-catch, ecosystem indicators useful for the SCRS, review of the work conducted under the short term by-catch contract and additional information on seabird data collection, assessment and management.

New information was presented about ecosystem models (including SEAPODYM and spatial multispecies production models), and the Ecosystem Considerations section of the IATTC Fisheries Status Report was reviewed, together with new information about by-catch characterization and by-catch mitigation measures. Regarding the optimum observer coverage, the discussion following the documents and analyses conducted during the meeting concluded that optimum coverage depends on both the frequency at which each species is caught and the variability in the amount (i.e. CPUE) of the by-catch, and thus it is difficult to provide a unique observer coverage level for all taxa and all fleets. However, the group agreed that at minimum observer coverage should be 5-10%. Different ecosystem indicators covering some of the major types of indicators identified in the literature were presented and discussed by the group in terms of data needs, meaning and usefulness. The data available in the ICCAT database was reviewed. The Sub-Committee indicated that these data should be used with caution since reporting of by-catch had been variable in the past. The Sub-Committee also revised the work conducted under the by-catch contract and made several suggestions for improvement. The final report is available as SCRS/2010/047rev. Finally, new information about seabird data collection, assessment and management was presented, including latest advice on mitigation measures that was consistent with the advice provided in 2009.

The Sub-Committee also made a series of Recommendations about by-catch data collection through observer programs, development of reporting mechanisms, and research on by-catch characterization, mitigation measures, ecosystem models and indicators. The Sub-Committee also reaffirmed the recommendations made in 2009 regarding the seabird by-catch mitigation.

Document SCRS/2010/013 contains the detailed report of the meeting.

*9.5 Mediterranean Swordfish Stock Assessment*

The meeting was held in Madrid, Spain, June 28 to July 2, 2010. The Mediterranean Swordfish Executive Summary reflects the major results of this assessment. The detailed report of the meeting can be found in document SCI/2010/033.

*9.6 Mediterranean Albacore Data Preparatory Meeting*

The meeting (Madrid, June 28-July 2, 2010) was held at the request of the albacore Species Group during the SCRS to review and prepare in advance of the future reassessment of the stock. The detailed information of the meeting is included in SCI-032.

Albacore fisheries are characterised by high spatio-temporal variability in landings and fishing patterns. The gears used are surface longlines, troll and gillnets, mainly in the western Mediterranean. Likewise, bait boats and rod and reel are also used. In the last decade, 69% of the total Mediterranean catch was reported by Italy, while Greece reported about 20%, followed by Spain (5%), Cyprus (4%) and Turkey (2%).

Several sport associations in the Mediterranean conducted a survey of its membership regarding the change in availability of albacore in the sport fishery. They indicated that albacore has largely disappeared from these grounds.

Task I nominal catch, Task II catch and effort and size frequencies, as well conventional tagging information, was examined. Of note is the weight of unclassified gear in the overall catches (nearly 100% in the 1980s, about 40% in the 1990s and 30% in 2000). The discrimination of gears (longline, gillnets) is crucial for fisheries-based characterization and subsequent modelling approaches (catchability of the various fleet components, biomass abundance indices estimations, exploitation rates and selectivity patterns).

The catch and effort data available (SCI-032, Table 2) evidences the poor coverage of the available statistics when considering the two. At the same time, there is large heterogeneity in the level of stratification (in particular time strata, geographical strata, various efforts units for the same gear) even within the same CPC. This revision should facilitate the CPUE standardization in the future. It was difficult to match the reported data in Task I and Task II, catch and effort data at the fishery level fleet/gear combinations.

The size composition information presents poor coverage (Task II). There are no catch rates estimations from the diverse fleets targeting albacore.

Biological information such as length-weight relationship and growth parameters are partially available from some regions within the Mediterranean. The stock can be classified as data poor. A variety of indicators have been proposed. Evaluation of the robustness of any indicators used for management is essential. Credibility with stakeholders is important, especially where results are based on incomplete data.

The detailed report of the meeting is presented as document SCRS/2010/016.

*9.7 Bigeye Stock Assessment Session*

Please see item 9.2 that describes the report from the data preparatory meeting and the assessment meeting and corresponding discussions. Document SCRS/2010/011 contains the detailed report of the meeting.

*9.8 Bluefin Data Preparatory Meeting*

The SCRS conducted a data preparatory meeting for Atlantic and Mediterranean bluefin tuna during June 14-19, 2010 in Madrid, Spain. The detailed report of the meeting is presented as document SCRS/2010/014.

*9.9 Bluefin Stock Assessment Session*

The SCRS conducted a comprehensive assessment of Atlantic and Mediterranean bluefin tuna during September 6-14, using the available data (catch, effort and size statistics).

The detailed report of the bluefin tuna assessment meeting was adopted by correspondence during the SCRS plenary.

## 10. Report of Special Research Programs

*10.1 Atlantic-wide Bluefin Tuna Research Programme (GBYP)*

Dr. Antonio Di Natale, General Coordinator, presented the report on the Atlantic-wide Bluefin Tuna Research Programme (GBYP) activities carried out in 2010.

The report was adopted and is attached as **Appendix 6**.

*10.2 Enhanced Research Program for Billfish*

The report of the Program for Enhanced Research on Billfish, together with the proposed budget for 2011, was presented by the Program Coordinator, Dr. David Die.

The report was adopted and is attached as **Appendix 7**.

## 11. Report of the Sub-Committee on Statistics

Dr. Mauricio Ortiz presented the report (**Appendix 8**) of the Sub-Committee of Statistics which held its session in Madrid, September 27 and 28, 2010. In reviewing the 2009 recommendations from this Sub-Committee, the following were noted: (i) The 2009 Data Confidentiality proposal for ICCAT was still pending approval by the Commission. The Sub-Committee reiterated the importance of this proposal and suggested re-submitting it as the main recommendation from the SCRS this year. (ii) The Secretariat upgraded the internet WiFi hardware for meeting which greatly facilitated network accessibility during 2009/2010 inter-sessional and SCRS meetings.

The main topics of discussion during 2010 Sub-Committee of Statistics meeting were: (i) confusion in the datelines of data submission for the inter-sessional meetings, particularly between data preparatory and assessment meetings; (ii) undefined geographic areas reported for Task I information, and (iii) the report of by-catch information by CPCs.

Finally, the Committee approved the recommendations adopted by the Sub-Committee on Statistics which will be attached to the general recommendations of the SCRS.

## 12. Report of the Sub-Committee on Ecosystems

Dr. Haritz Arrizabalaga, the Convener of the Sub-Committee on Ecosystems chaired the meeting Sub-Committee on Ecosystems presented the report of the meeting held in Madrid, May 17 to 21, 2010 **(Appendix 9)**.

The Committee agreed on the need of completing the databases created by the short term contract coordinator and keep them operational to be useful and to help achieve the objectives and mandate of the SCRS. In addition, it was recognized the need to work on the bycatch issues agreed by the Joint tuna RFMO Working Group on bycatch in Brisbane. Taking into account the enhanced magnitude of bycatch related work that is anticipated, the Committee supported the request that the Commission funds a full-time Bycatch Coordinator position at the Secretariat.

The Committee approved the recommendations adopted by the Sub-Committee on Ecosystems which will be attached to the general recommendations of the SCRS.

## 13. Consideration of Implications of the Tuna RFMOs workshops held in 2010 in Barcelona and Brisbane

### *13.1 Joint Tuna RFMOs Meeting of Experts to Share Best Practices on the Provision of Scientific Advice*

Dr. Laurie Kell presented the report of the Joint Tuna RFMOs Meeting of Experts to Share Best Practices on the Provision of Scientific Advice held in Barcelona, Spain, May 31 to June 2, 2010.

Similar problems are faced by all the tuna RFMOs, in that same tuna species are fished worldwide within similar offshore pelagic ecosystems, whilst most tuna fleets and gears are highly mobile using the same technology and selling within similar markets. Therefore, the scientific problems faced in stock assessment by all tuna RFOs are very similar. The workshop reviewed and made recommendations with regard to future priorities in data collection and tuna research in order to allow the RFMOs to provide more efficient and fully transparent scientific advice on their tuna stocks and their pelagic ecosystems.

The agenda covered (i) Routine annual data collection, (ii) Biological Data (iii) Stock assessment, (iv) Communication between RFMOs and the world (v) Enhanced co-operation between tuna RFMOs. IN addition a variety of presentations were made on FAO tuna related activities, the CLIOTOP integrated and coordinated ecosystem-based research for improved scientific advice on tuna fisheries at a global scale. The development of a management procedure by CCSBT, and capacity building by the RFMOs. The report of the meeting and all the presentations are available at http://www.iccat.int/Documents/Meetings/Announce/2010-RFMO/2010-RFMO-1.htm
The main recommendations that came out of the meeting were:

*Routine data collected by year: Catch, effort and size data*

1. All members of t-RFMOs are called upon to give a top priority to the provision of data of good quality in a timely manner, according to the existing mandatory data requirements of tuna RFMOs, in order to facilitate the work of tuna RFMOs scientific bodies in the provision of scientific advice based on the most recent information.
2. Lags in the submission of fishery data should be reduced making a full use of communication technologies (e.g. web based) and efforts should be undertaken that basic data formats are harmonized.
3. Efforts should be undertaken so that basic data used in stock assessment (catch, effort and sizes by flag and time/area strata) provided by members should be made available via the websites of tuna RFMOs or by other means.
4. Fine scale operational data should be made available in a timely manner to support stock assessment work, and confidentiality concerns should be addressed through RFMOs rules and procedures for access protection and security of data.
5. Tuna RFMOs should ensure adequate sampling for catch, effort and size composition across all fleets and especially distant water longliners for which this information is becoming limited.
6. Tuna RFMOs should cooperate to improve the quality of data, in particular for methods to estimate: (1) species and size composition of tunas caught by purse seiners and by artisanal fisheries and (2) catch and size of farmed tunas.
7. Tuna RFMOs should use alternative sources of data, notably observer and cannery data, to both validate the information routinely reported by Parties and estimate catches from non-reporting fleets.

*Biological data*

8. Regular large scale tagging programs should be developed, along with appropriate reporting systems, to estimate natural mortality growth and movement patterns by sex, and other fundamental parameters for stock assessments.
9. Archival tagging should be an ongoing activity of tagging programs as it provides additional insights into tuna behavior and vulnerability.
10. Spatial aspects of assessment should be encouraged within all tuna RFMOs in order to substantiate spatial management measures.
11. The use of high-resolution spatial ecosystem modeling frameworks should be encouraged in all tuna RFMOs since they offer the opportunity to better integrate biological features of tuna stocks and their environment.

*Stock assessment*

12. Tuna RFMOs should promote peer reviews of their stock assessment works.
13. Tuna RFMOs should use more than one stock assessment model and avoid the use of assumption-rich models in data-poor situations.
14. Chairs of Scientific Committees should jointly develop checklists and minimum standards for stock assessments.

*Communication by tuna RFMOs*

15. Standardized executive summaries should be developed for consideration by all tuna RFMOs to summarize stock status and management recommendations. These summaries should be discussed and proposed by the chairs of the Scientific Committees at Kobe 3.
16. The application of the Kobe 2 strategy matrix should be expanded and applied primarily to stocks for which sufficient information is available.
17. Tuna RFMOs should develop mechanisms to deliver timely and adequate information on their scientific outcomes to the public.

18. All documents, data and assumptions related to past assessments undertaken by tuna RFMOs should be made available in order to allow evaluation by any interested stakeholder.

*Enhanced cooperation between tuna RFMOs*

19. Chairs of Scientific Committees should establish an annotated list of common issues that could be addressed jointly by tuna RFMOs and prioritize them for discussion at the Kobe 3 meeting.
20. Tuna RFMOs should actively cooperate with programs integrating ecosystem and socio-economic approaches such as CLIOTOP to support the conservation of multi-species resources.

*Capacity-building*

21. Where determined by a Tuna RFMO, a review of the effectiveness of capacity-building assistance already provided should be undertaken. Reviews of tuna scientific management capacity in developing countries, within the framework of the respective RFMO may also be conducted at their request.
22. Developed countries should strengthen in a sustained manner their financial and technical support for capacity-building in developing countries, notably small island developing States, on the basis of adequate institutional arrangements in those countries and making full use of local, sub-regional and regional synergies.
23. Tuna RFMOs should have assistance funds that cover various forms of capacity-building (e.g. training of technicians and scientists, scholarships and fellowships, attendance to meetings, institutional building, development of fisheries).
24. Tuna RFMOs, if necessary, should ensure regular training of technicians for collecting and processing of data for developing states, notably those where tuna is landed.
25. The structural weaknesses in the receiving mechanism for capacity building within a country should be improved by working closely with Tuna RFMOs

### *13.2 Joint Tuna RFMOs Meeting of Experts on Tuna RFMO Management Issues Relating to by-catch*

Dr. Haritz Arrizabalaga presented the report of the International Workshop on tuna RFMO management issues relating to by-catch that took place in Brisbane, Australia, June 23-25 2010, with special emphasis on items related with the SCRS.

The SCRS reviewed the report of the International Workshop on tuna RFMO management issues relating to by-catch that took place in Brisbane, Australia, June 23-25 2010, with special emphasis on items related with the SCRS.
The objectives of the meeting were to review the available information on by-catch, to provide advice to tuna RFMOs on best practices, methods and techniques to assess and reduce the incidental mortality, to develop and coordinate relevant research and observer programs, and to recommend mechanisms to streamline the work of t-RFMOs in this field and avoid duplication.

Five background documents were prepared and distributed to the participants summarizing the relevant information available for each of the taxa (turtles, seabirds, mammals, sharks and finfish).

The discussion highlighted the difficulties faced by t-RFMOs to characterize the impact of their fisheries e.g. because impacts from other fisheries not under the mandate of the RFMO need to be considered, as well as some other sources of mortality such as land threats, lack of expertise/knowledge about the by-caught species, lack of data, etc. The group also highlighted the importance of implementing observer programs (with a minimum of 5%), and to conduct Ecological Risk Assessments as a way to prioritize between species.

The main recommendations with implications for the SCRS are summarized below:

- Adopt standards for by-catch data collection that allow assessing the impact of fisheries on the populations as well as the effectiveness of by-catch measures.
- Evaluate the effectiveness of mitigation measures, as well as the impact on target species. Identify research priorities and facilitate a full compendium of information regarding mitigation techniques.
- As a matter of priority, establish a joint T-RFMO technical working group to promote cooperation and coordination on by-catch issues. The Working Group would include 2-3 representatives from each tuna RFMO, with the following ToRs:
  - harmonize data collection protocols
  - identify species of concern that require immediate action
  - review methods to determine population status
  - review analyses to identify factors contributing to by-catch
  - review existing mitigation measures and consider the utility of new ones, based on research findings.
  - review and compile information on by-catch research and delineate future research priorities.
  - Collaborate with the fishing industry, IGOs, NGOs, Universities and other parties as necessary.
  - Promote capacity building programs for developing countries

## 14. Consideration of plans for future activities

### *14.1 Annual Work Plans*

The rapporteurs presented the 2011 Work Plans for the various Species Groups. These Plans were adopted and are attached as **Appendix 5.**

Depending on the decision of the Commission, the inter-sessional meetings next year will be Workshop on the use of R, Working Group on the analysis of the BFT aerial surveys, conventional tagging and biological sampling, Working Group on issues related with the SCRS organization, Methods Working Group, blue marlin assessment and white marlin data preparatory meeting, Sub-Committee on Ecosystems, tropical Working Group on the revision of Ghanaian statistics (Phase I), bluefin Working Group on methodological issues and electronic tagging, sharks data preparatory meeting to conduct ecological risk analyses, albacore South Atlantic and Mediterranean albacore assessments meeting; The meeting timetable is attached as **Table 14.1.**

### *14.2 Inter-sessional meetings proposed for 2011*

Taking into account the assessments mandated by the Commission and the Committee's recommendations for research coordination the proposed inter-sessional meetings for 2011 are shown as in **Table 14.1**. The Committee noted that the schedule is ambitious and that there is a need to maintain some flexibility in order to account for any changes that may result from the deliberations held by the Commission in November 2010 and meetings scheduled by other RFMOs.

### *14.3 Date and place of the next meeting of the SCRS*

The next meeting of the SCRS will be held in Madrid from the October 3-7, 2011; the Species Groups will meet from the September 26-30, 2011.

| ICCAT MEETINGS 2011 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | Fri | Sat | Sun | Mon | Tue | Wed | Thu | Fri | Sat | Sun | Mon | Tue | Wed | Thu | Fri | Sat | Sun | Mon | Tue | Wed | Thu | Fri | Sat | Sun | Mon | Tue | Wed | Thu | Fri | Sat | Sun | Mon | Tue | Wed | Thu | Fri | Sat |
| Jan | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | | | |
| Feb | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | | | | | |
| | | | | | | | | | | | R tools Workshop | | | | | | | GBYF A.S./Tag.conv./Bio. Samp. | | | | | | | | | | | | | | | | | | | |
| Mar | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | | | | | | WG Org. | | | | | | | | | | | | | | | | | | | Methods WG | | | | | | | | | | | | |
| Apr | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | BUM ass/WHM data | | | | | | | | | | | | |
| May | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | | |
| | | | | | | cir. books Mem | | | | | SC-ECO Mem | | | | | | | | | | | | | | Trop S. Mbrec. | | | | | | | | | | | | |
| Jun | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | |
| | | | | | | TROP WG pn. | | | | | | | | | | | | | | | | | | | | | | | | | | BFT WG/Bect. Tag | | | | | |
| Jul | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | | | | |
| | | | | | | | | | | | TRFMOs 3 meeting | | | | | | | | | | | | | | SW data prep | | | | | | | | | | | | |
| Aug | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | |
| Sep | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | |
| | | | | | | | | | | | ALB SA/MED Assess. | | | | | | | | | | | | | | | | | | | | | Species Groups | | | | | |
| Oct | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | | | | |
| | | | | SCRS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nov | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | | |
| Dec | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |

Possible ICCAT Held [illegible]

## 15. General recommendations to the Commission

### *15.1 General recommendations to the Commission that have financial implications*

*Albacore*

The Committee has recommended initiating and focusing on an albacore research program for North Atlantic albacore. Research on North Atlantic albacore depends on available funds supported annually by Contracting Parties individually involved in the albacore fisheries. The research plan will be focussed on three main research areas: biology and ecology, fisheries data, and management advice during a four-year period. Detailed research aims are presented in document SCRS/2010/155. The requested funds to develop this research plan have been estimated at a cost of 4.3 million Euros. Details of the economic plan are provided in the Albacore 2011 Work Plan (**Appendix 5**).

*Bluefin tuna*

The SCRS recommends that a defined methodology should be adopted by the Commission, in order to ensure the regular funding of the Atlantic-wide Research Programme for Bluefin Tuna (GBYP) to support the regular follow-up of the programme and provide all CPCs concerned a method to calculate their voluntary contribution.

The SCRS recommends that all CPCs concerned shall provide the necessary support to the Atlantic-wide Research Programme for Bluefin Tuna (ICCAT-GBYP) in order to:

- help the ICCAT Secretariat initiatives in the framework of the GBYP, particularly for contacts with the national Authorities concerned;
- ensure assistance for the necessary permits concerning the GBYP activities in their territorial waters or airspace;
- provide the necessary contacts at the national level for ensuring the regular development of the GBYP.

The Commission should consider the merits of a research TAC set aside to help fund the GBYP. A research allocation of up to 50 t could be quite beneficial in supporting the GBYP research enterprise while reducing the necessity for voluntary contributions for the program.

Fishery-independent information is crucial to reduce uncertainty in assessment models that would otherwise be based only on catch and fishing effort data, particularly when those data become biased owing to management regulations. The Committee strongly recommends the development of a large-scale tagging program and fishery-independent surveys of abundance to better track trends in biomass and better estimate fishing mortality rates.

Given the above two concerns, it is essential that the Commission seek the means to fully fund the GBYP.

*Billfish*

The Commission should increase the contribution to the Enhanced Billfish Research Plan by 10,000 Euros in 2011 to allow the plan to be fully accomplished.

*Tropical Tunas*

The Committee recommends that a broad-scale tagging program for tropical tunas be implemented in 2011. The expected cost for this program is 11,400,000 Euros.

*Sub-Committee on Ecosystems*

The SCRS recommends to implement, as soon as possible, observer and logbook programs to permit quantify the total catch (including by-catch), its composition and disposition. The initial minimum observer coverage recommended is 5-10%, although the precision of by-catch estimates might remain low for certain species and higher coverage may be warranted depending upon the Commission's objectives.

Moreover, the magnitude of by-catch related work is continuously increasing and it is essential that the Commission funds a full-time By-catch Coordinator position at the Secretariat to make all the information operational and useful for the mandate of the SCRS.

Work on harmonization of by-catch related activities with other Tuna RFMOs.

*Sub-Committee on Statistics*

Due to the overall and increasing workload, the Committee is concerned that the structural support available to the Secretariat, will be unable to fully meet its tasks and responsibilities for both scientific and compliance related duties especially moving into the future, and thus recommends a review of these elements be undertaken, in particular, to evaluate the available human resources requirement and recommend improvements.

*15.2 Other recommendations*

*Albacore*

In order to carry out the assessment of the South Atlantic stock [Rec. 07-03] in 2011, it is recommended that scientists involved with surface (Namibia and South Africa) and longline (Chinese Taipei and Japan) fleets participate in the assessment session. Otherwise the results from the analyses might suffer from the lack of expertise on the nature of the data and the information available.

In the case of the first attempt to assess the Mediterranean albacore stock it is emphasized to follow the Work Plan and Recommendations from the Data Preparatory meeting (SCRS(2010/015), as well participation from scientists with expertise on the main fisheries exploiting the stock.

*Bluefin tuna*

The Committee reiterated that it is essential to obtain representative samples of otoliths and other tissues from all major fisheries in all areas. Such collections will provide direct estimates of the age composition of the catch (avoiding the biases associated with determining age from size), direct estimates of the stock of origin (a key factor to improve our ability to conduct mixing analyses) and will help in verifying current assumptions concerning age-at-maturity and fecundity-at-age.

*Tropical Tunas*

The Committee is supportive of research programs to mitigate by-catch in purse seine fisheries (especially on FADs), such as the program that ISSF has initiated. The Committee notes that some issues and potential solutions are region-specific, and therefore recommends that part of the research be conducted in the Atlantic Ocean.

The Committee noted that some National scientists would like to access the cannery data that ISSF-participating companies are submitting to the Secretariat. This would be extremely useful in several ways. For example, in cases where those national scientists have vessel logbooks which could be matched with the cannery information on a trip-by-trip basis, thus allowing for improved estimates of catches by species. For this reason, the Committee encourages the development of MOUs that will allow these national scientists to access the data while protecting the confidential components of the ISSF data submissions.

*Small Tunas*

Include blackfin tuna (*Thunnus atlanticus*) in the small tunas chapter of the *ICCAT Manual* and include dolphinfish (*Coriphaena* spp.) among the species considered by the ICCAT Small Tunas Species Group.

*Sharks*

Due to the vulnerability and deficient statistical information on these species, it is essential to advance in research and the collection of data in order to assess the stocks. Until this information is available, the Commission should adopt conservation measures that reduce fishing mortality. In species where there exists concern in terms of over-exploitation and there is expectancy of post-discard survival, it is recommended that retention be prohibited. The Committee recognizes the possible difficulties of compliance due to identification and that other measures could be adequate.

The Committee recommends that the countries generate research programs to minimize by-catch and the discard mortality of sharks, particularly porbeagle. It is recommended that the Commission work with other RFMOs in order to achieve recovery of the stocks in the North Atlantic and prevent over-exploitation in the South Atlantic.

The Committee recommends continuing activities with the ICES Working Group on Sharks, participating in the porbeagle data preparatory meeting that ICES will hold in 2011, and in the future assessment to be carried out in 2012.

Considering that *Carcharhinus longimanus* is found among the five species with the highest risk in a Ecological Risk Assessment carried 2008, that it makes up a small part of the catches, has high rates of survival and is easily identifiable, that a significant proportion of its catches is comprised of juveniles. The Committee recommends a precautionary approach and suggests establishing a minimum size of catch of 200 cm TL. It is suggested that research be carried out on the life history of this species aimed at adopting future Recommendations.

The Committee recommends holding a data preparatory meeting in 2011 to generate the necessary information to conduct an Ecology Risk Assessment on sharks in 2012. The national scientists should meet and submit all the information available on the fishing operations and the life history of pelagic sharks.

*Swordfish*

Working Committee Participation. The SCRS noted that attendance at inter-sessional meetings is becoming an increasing concern. For example, during the recent Atlantic swordfish assessment, one of the longest CPUE time series was submitted by correspondence, without the author or another scientist familiar with the analyses being present at the meeting. This made it difficult to evaluate the suitability of the time series. The Committee recommends that CPCs that can make valuable contributions to the assessments make the necessary arrangements to ensure the presence of their national scientists at those meetings.

*Sub-Committee on Ecosystems*

The SCRS recommends that research be conducted on measures to mitigate by-catch in ICCAT fisheries. The research should include the effect of mitigation measures on both by-catch and target species. The SCRS further recommends periodically submitting summary reports to the SCRS on subjects like by-catch characterization, trends in by-catch rates, effect of mitigation measures, etc.

*Assessments & Methods*

Regarding standardizing practices among Tuna RFMOs, the Committee concluded that harmonization should be encouraged between RFMOs for data inputs, data structure and data formats, but not necessarily for assessment methods. The Committee encourages making data available on the web, that can be used in meta-analysis type research for highly migratory species. To facilitate this harmonization process, the Committee recommends holding joint meetings with scientists from other tuna RFMOs.

*Sub-Committee on Statistics*

The Committee reiterates the importance of adopting the Data Confidentiality Policy for the ICCAT Secretariat, and reminds the Commission that a proposal was approved and presented by the SCRS in 2009. The Committee also resolved that the Data Confidentiality Policy will be resubmitted to the Commission at the 2010 ICCAT Commission Meeting.

The Committee approved the protocol prepared by the Secretariat regarding travel funding for scientific meeting participation and recommended that at a minimum, two-week lead times be obligatory.

**16. Responses to Commission's requests**

*16.1 Defining a standardized methodology for the collection of sport and recreational fisheries data for all species under the ICCAT mandate, including estimates of post-release mortality and data from sampling, tagging and counting programs*

In 2006, the Commission resolved that the SCRS should establish a Working Group to evaluate sport and recreational fishing activities. The Working Group would:

a) Examine the biological and economic impact of recreational and sport fishing activities on ICCAT managed stocks and assess the level of harvest.

b) Based on available information, identify approaches for managing the recreational and sport fishing activities in ICCAT fisheries.

c) Report the results of deliberations to the Commission and, as appropriate, propose recommendations for next steps to manage the recreational and sport fishing activities in the Convention area. CPCs shall report prior to the Working Group meeting the techniques used to manage their sport and recreational fisheries and methods used to collect such data.

[...]

With regard to item (a), the group recognized that recreational and sport fishing activities can have considerable biological and economic impact on ICCAT managed stocks. Furthermore, these impacts are not currently estimable due to a general lack of data.

With regard to item (b), the group recognized that the evaluation of suitable management measures requires reliable statistics be reported by all CPCs with non-trivial recreational and sport fisheries, and would be further improved by concomitant socio-economic data. The group recommended enhanced efforts by CPCs to collect and report such information.

With regard to item (c), the CPCs that attended the group made reports on their sport and recreational fishing activities, and the techniques used to collect data and manage these activities. These reports have been compiled, and will be reported to the SCRS during the 2011 Meeting of the Working Group on Stock Assessment Methods.

*TAKING INTO ACCOUNT* the need to improve stock assessments by obtaining reliable estimates of total removals (harvest + dead discards) of ICCAT managed stocks; the Committee recommended the following:

[...]
[...]

1) In order to develop appropriate estimates of harvest and dead discards by recreational and sport fishing activities, the SCRS recommended that each CPC:

    a) Identify the "universe" of recreational fishing participants.
    b) Sample that universe with appropriate coverage to allow estimation of total removals with sufficient accuracy and precision.
    c) Produce or obtain estimates of release mortality to facilitate the quantification of fish released alive that subsequently die due to interaction with fishery.

2) The Committee concluded that sufficiently accurate and precise estimates of total recreational removals require CPCs to collect the following information through national and/or regional sampling programs. This data would be retained by CPCs, but used to develop the estimates of total recreational removals that are reported to ICCAT. The following should be considered minimum standard practices. These are the essential components for estimation of Task I and Task II data to meet reporting obligations.

    a) Catch by species
    b) Length/Weight of landed fish
    c) Discards by species
    d) Length/Weight of discarded fish
    e) Disposition of discards (e.g. released alive and likely to survive, released alive but unlikely to survive, discarded dead, used for bait).
    f) Location and time of fishing trip
    g) Estimates of release mortality by species

3) The group acknowledged that some CPCs have already developed successful sampling programs, and currently use data collected by these programs to report recreational Task I and Task II statistics to ICCAT. Several of these programs were identified by the group, and the methodologies were discussed. This information will be re-compiled, and will be further evaluated by the SCRS in 2011.

*16.2 Continuation of the evaluation of data elements pursuant to Rec. 05-09*

In response to the Commission Res. [05-09], the SCRS through the Sub-Committee on Statistics and the Secretariat prepare each year a summary of the impact on stock assessment and evaluations from the lack of, deficiencies and limitations of data available for the Working Groups. Since 2007, a questionnaire has been distributed to the rapporteurs of each working group that had an assessment or data preparatory meeting during the year. The questionnaire attempts to collect the working group data availability and impact on their analysis, as well specific recommendations to improve their assessment work. During 2010, three ICCAT species were assessed: bluefin tuna east and west stock units, the bigeye tuna stock and the Mediterranean swordfish stock. Besides, two data preparatory meetings were held, for the Mediterranean albacore stock and for the blue marlin stock. Appendix 1 includes the response to the questionnaires by the Chairs of the respective Working Group in 2010.

b. No area/ time of year of capture information
c. Others
- In relation to T2SZ, the WG also noted the incompleteness and heterogeneity of historical size data in some of the most important fisheries. Some size samples series are very heterogeneous with variations in: size class types (length: 1, 2, 5cm; weight: 1, 2, 5, 10 kg); size frequency types (LJFL, WGT, CLCK, LD1, etc.); size interval types (lower limit, central point, upper limit, many times unknown); time stratification (by year, quarter and month); spatial distribution (1x1, 5x5, 10x10, 10x20 and 20x20 degree squares).

27. What were the conclusions/recommendations from the scientific group with regards to the data available and likely assessment analysis to be performed?
- The WG recommended the need to stress that CPC's should report Task I and Task II for intersessional meetings by the deadlines provided by the Secretariat.
- The WG should conduct an analysis on gaps of reported catches from various CPC's by considering Task I and Task II data and the methods used during the sailfish data preparatory meeting in 2008.
- In noting that estimation of relative abundance indices is always best done at the highest spatio-temporal resolution warranted by the available data, the WG recommended that all CPCs, and especially those that have important catches of blue marlin, provide updated relative abundance indices obtained from such high resolution CPUE data.
- The WG recommended that the trend analysis conducted in the 2006 blue marlin stock assessment be updated in the 2011 stock assessment meeting. It also recommended that surplus production models conducted in the 2000 blue marlin stock assessment be updated in the 2011 stock assessment meeting.
- The WG recommended to establish a protocol (web based) to continue progressing with the application of a statistically integrated assessment model that would take into consideration, seasonal catch, effort, size information for all gears, and the new geographical stratification proposed during the blue marlin data preparatory meeting.

28. For each stock, please chose and describe the recommendations of the scientific group for the assessment analyses
a. Incomplete data, the group doesn't recommend any further analysis with it.
b. Highly deficient data of catch and effort need to restrict analyses to simple aggregated models (BUM, WHM, SAI).
c. Sufficient data to carry out age/or group aggregated analysis (possibly)
d. Sufficient data to perform size base evaluations

29. What were the priorities identified by the scientific working group in order to improve data input for future assessment analysis (one per stock, in priority order)

The classification of species specific catch towards the complete elimination of unclassified billfish reported to the ICCAT data base.

30. Other recommendations to the data collection programs (i.e. individual ICCAT members) or the Secretariat data management group.

Enhance species specific monitoring program in 3 key landing ports in northeastern Venezuela and at sea observer coverage on the Venezuelan small scale fleets that targets tuna and tuna-like species (in particular BUM, WHM, SAI, SPF, and SPG).

Enhance the collection of species specific catch and detailed effort information and biological sampling in order to collect information on population parameters (i.e., size, sex, maturity, age, and genetic stock identification) from these small scale fisheries.

**SWORDFISH**

Mediterranean swordfish

No data preparatory meeting was realized. The information below reflects the situation identified during the stock assessment session.

Deficiencies

Lack of 2009 data did not allow to include that year in the assessment as it was initially planned
Missing Task II 2008 data from Tunisia (even Task I was unofficial), which has an important fishery (faced through substitutions).
Lack of detailed area/time capture information within a given year (low spatiotemporal resolution).

The Group finally considered that the available data were sufficient to carry out age-structured assessment.

The Group recommended on time data submission following ICCAT requirements concerning spatiotemporal resolution and improved participation of scientists from the Mediterranean countries in the relevant species group meetings.

*16.3 Identify as precisely as possible BFT spawning grounds in the Mediterranean in view of the creation of sanctuaries [Rec. 08-05]*

The 2008 *Recommendation Amending the Recommendation by ICCAT to Establish a Multi-annual Recovery Plan for Bluefin Tuna in the Eastern Atlantic and Mediterranean* [Rec. 08-05], element 25 requests for the annual meeting of the Commission in 2010, that the SCRS identify as precisely as possible spawning grounds in the Mediterranean in view of the creation of sanctuaries.

Information has been gathered over a number of years about the location and timing of bluefin spawning in the Mediterranean. While considerable literature is known to exist with which to characterize spawning areas and oceanographic covariates in the region, a complete synthesis of this information will require considerable time and further investigation in order to compare historical knowledge with more contemporary observations. A complete characterization of bluefin spawning in the Mediterranean will also require a better understanding of the biology of bluefin and its importance in achieving management objectives; an objective of the GBYP.

The most contemporary, although provisional and likely incomplete without fishery independent information view of spawning locations in the Mediterranean, considering overlap with the fishery, comes from the VMS data now required for purse seine (and other) vessels fishing for bluefin in the Mediterranean during the spawning period (mid-May through mid-July). To this end, concentrations of purse seine vessel locations on fishing grounds can give a generalized view of the regions where schooling bluefin are susceptible to capture during spawning and pre-spawning aggregations. The 2008-2009 purse seine VMS data were used to identify spawning locations for which the GBYP aerial surveys of the bluefin spawning stock were conducted in 2010 (Figure 1). It is noteworthy that these areas are consistent with scientific knowledge available to SCRS. While spawning is known to have occurred outside of these general areas on the basis of location of larvae and other information, these 6 primary areas are believed to represent the dominant spawning areas in the recent past and also represent areas with heavy concentrations of fishing effort during the past few years. With additional data collected through the GBYP, a more refined and comprehensive evaluation of spawning areas and behaviors of bluefin in the Mediterranean will be possible.

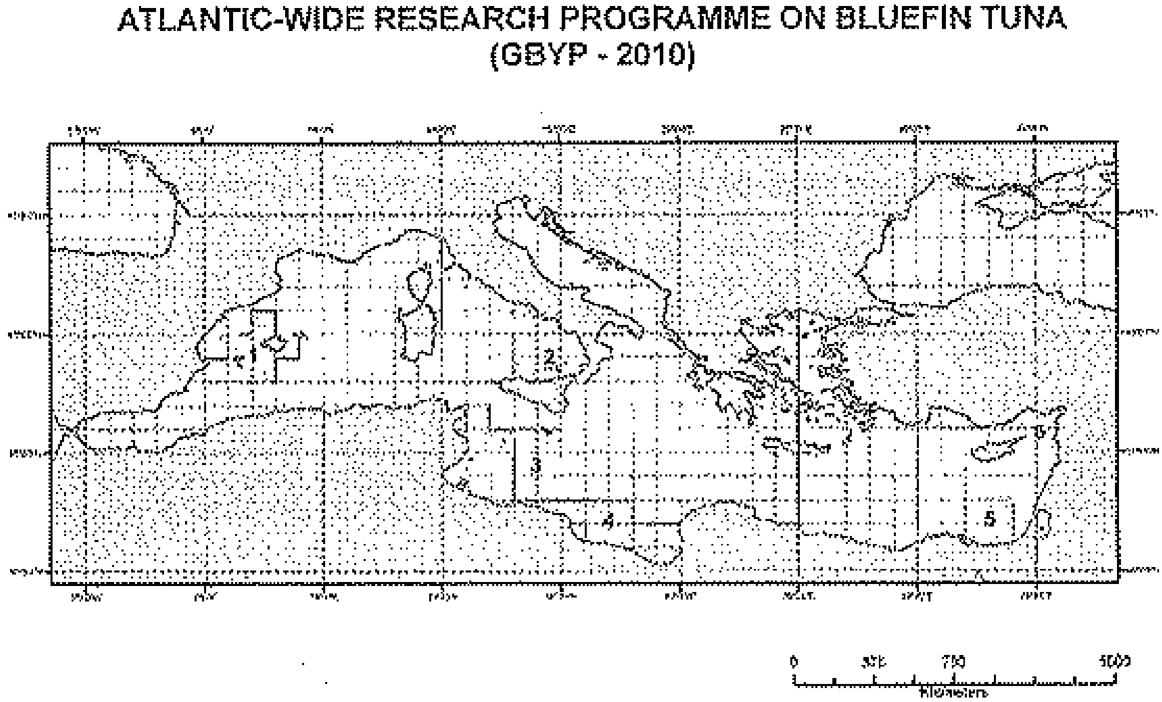



Figure 1. Spawning areas identified through analysis of VMS data used in the 2010 GBYP aerial survey program for surveying spawning biomass in the Mediterranean.

*16.4 Review of information on farmed bluefin tuna growth rates [Rec. 06-07; 08-05]*

The 2008 *Recommendation by ICCAT Amending the Recommendation by ICCAT to Establish a Multi-Annual Recovery Plan for Bluefin Tuna in the Eastern Atlantic and Mediterranean* [Rec. 08-05] states:

> 96. *"Each CPC shall define growth factors to be applied to bluefin tuna farmed in its cages. It shall notify to ICCAT Secretariat and to the SCRS the factors and methodology used. The SCRS shall review this information at its annual meetings in 2009 and 2010 and shall report to the Commission. The SCRS shall further study the estimated growth factors and provide advice to the Commission for its annual meeting in 2010."*

At the 2009 SCRS meeting, the Committee reviewed several industry-sponsored studies and concluded that the gain in weight of bluefin tuna in farms can be significantly higher than the value which has been used to-date (see SCRS/2009/192). The Committee recommended that Contracting Parties tentatively adopt growth factors that are consistent with those in Table 16.6 of the 2009 SCRS Report, although the Committee advised it is important to note that these growth factors do not take into account any of the losses that are known to occur (e.g., due to mortality, escapees and other sources of loss). The Committee advised that applying these factors to an amount of harvested bluefin in order to estimate the initial caged amount will likely result of an underestimate of the input to the cages.

In 2010, the Committee examined the implications of these growth factors by their application to observations from the Japanese fresh auction market weight distributions and found application of the weight gain rates from Table 16.6 (2009 SCRS Report), resulted in back-calculate fish weights at initial capture which seemed to show unrealistic size distributions, in that more fish below the 30 kg minimum are calculated as having been caught than would be expected given existing controls. The Committee reemphasized concern about using the available farmed bluefin tuna growth rates (SCRS/2009/192, 2009 SCRS Annual Report) to back-calculate individual fish weight, since those rates seem to represent a maximum weight gain that might be obtained only under the best of conditions; the consequence of the overestimation of growth rates would be an underestimate of sizes at original capture, such as appears to be occurring in application of these rates to recent observations.

The Committee also recommends that Contracting Parties continue to conduct studies that can lead to a better quantification of the inputs into cages. This includes average growth factors that take losses into account. However, more importantly, it is necessary to develop methods to measure the size of the fish entering the cages.

As real size samples at time of the catch are needed to significantly decrease uncertainties in future stock assessment, it is necessary to routinely use a system (dual camera system or any other operational technology) that will provide sizes of fish entering into cages. Therefore, the SCRS strongly encourages the farms to test these systems that have been recently developed as soon as possible.

*16.5 Review of data availability on the interaction of tuna fisheries on seabirds and sea turtles*

ICCAT [Res. 03-11] encouraged CPCs to report data of interaction of their fleet with sea turtles in the Convention area. Similarly, [Rec. 07-07] required the submission of similar data for seabirds. Reporting of by-catch information is essential to characterize the degree of interaction of by-catch species with ICCAT fisheries and to assess the overall impact of these fisheries on these species.

In 2009, the SCRS completed a seabird assessment. During the assessment, only a limited number of CPCs provided detailed information about interactions with seabirds, which greatly limited the assessment results (see Response to 07-07 in 2009). Information on by-catch has typically been made available in the form of SCRS documents. But, formal statistical submissions of information related with seabird and seaturtle interactions have not been possible due to the lack of established formal submission mechanisms for by-catch data (e.g., electronic forms, etc.)

During 2010, the By-catch Coordinator compiled into a database the by-catch information available in different working documents, peer reviewed publication and reports. The By-catch Coordinator and the SCRS identified the minimum data requirements to characterize the quantity, species composition, and disposition of the by-catch. These requirements included species identification, quantities (in number or weight), an indication of sizes, fate (kept, released alive or discarded dead), and proportion of fishing effort observed or sampled.

Although some of this information can be submitted using the existing reporting electronic forms, the SCRS requested the Secretariat to develop as soon as possible electronic forms specific for by-catch to facilitate the reporting of this type of information. It is recommended that CPCs submit their by-catch information using these new forms as soon as they become available.

*16.6 Review of Ghana's action plan to strengthen the collection of statistical data*

In 2009, the Commission requested Ghana to submit to ICCAT an action plan in order to strengthen the collection of statistical data (Task I and II, including size composition) and to develop control measures so as to ensure the full implementation of conservation and management measures (Paragraph 5, Rec. 09-01). Thus, Ghana presented the document "Ghana's action plan to strengthen the collection of statistical data (Task I and Task II) and control measures to ensure the full implementation of conservation and management measures" (ICCAT Circular #908/10).

In summary, this plan intends to assure the collection of Task I and Task II fishery statistics by means of (i) obtaining data from the tuna canneries which will allow to breakdown the total catch of Ghanaian vessels by species (Task I); (ii) completing and submitting to Ghanaian authorities the ICCAT logbooks after every fishing trip which will be required by law (for Task II); (iii) increasing the number of sampled fish, following SCRS recommendation, to 500 individuals per vessel and trip (Task II size); and (iv) including observers onboard in every purse seiner. In order to assure that all Ghanaian flag vessels are covered under this action plan, Ghana has signed a MoU with Côte d'Ivoire to sample vessels that unload tuna at the port of Abidjan. Finally, as a control measure the fishery licenses will be renewed quarterly provided that catch data and logbook data are correctly submitted.

The Committee acknowledges the commitment made by Ghana to strengthen the collection of statistical data and hopes that Ghana will make available the human and financial resources necessary to achieve this plan. The Committee encourages Ghanaian scientists and any other interested parties to continue in the analysis and revision of Ghanaian statistics. The Secretariat informed that some data from Ghanaian fleet unloading tuna in Abidjan were already received, although improvement in the format is required before they can be analysed.

The Committee notes that there may be subtle differences in the sampling programs to collect fishery statistics for purse seiners in Abidjan and it would be convenient that both sampling programs follow the same standard and criteria in order to facilitate joint analysis of standardized data. In that sense, as different teams are responsible for the Ghanaian and European PS sampling in Côte d'Ivoire, it would be convenient to enhance collaboration and coordination between both groups. The Committee recommends, as a first step, that a SCRS document explaining in detail how the Ghanaian sampling program is carried out, be prepared by Ghanaian scientists.

The Committee also discussed specific issues related to the Ghanaian sampling program as well as to the plan of work in order to review and analyse actual and past Ghana fishery statistics. For example, the issue of whether the "*faux-poisson*" is computed in the logbooks or not was discussed; which can be cross-checked based on logbook data and observer onboard data. Similarly, it was commented that various projects with the aim to improve Ghanaian fishery statistics has been carried out in ICCAT; which will need to be reviewed to get a general overview of the current situation of Ghanaian Statistics.

In light of those issues, the Committee recommends the establishment of a Working Group with the participation of scientists who are familiar with the fishery in the region in order to analyse and study different approaches to improve the collection of Ghanaian fishery statistics as well as revise past data.

The Terms of Reference of this Working Group are described in the Tropical's Work Plan for 2011.

*16.7 Evaluation of the effect of the closure contained in [Rec. 08-01] and alternative closures*

In 2008, the Commission requested the SCRS to evaluate the closure contained in the proposal from Ghana and Côte d'Ivoire (Annex 1 of Rec. 08-01), and any alternative closure, taking into account the need to reduce the catch of juvenile fish, and make appropriate recommendations to improve the closure.

The Committee considered in its 2009 meeting the past closure [Rec. 99-01], the current closure, [Rec. 04-01] and the proposed closure Annex 1 of [Rec. 08-01]. However, it should be noted that the data available to the Committee are not of sufficient detail and quality required to allow carrying out this sort of evaluation in a fully satisfactory manner. For example, there was a lack of catch statistics of a major country in this fishery. Moreover, the lack of compliance of past/present moratoria in addition to the changes in the population/fishery, which have occurred in the period studied due to an important effort reduction, make it difficult to separate moratorium and effort reduction effects in the reduction of juvenile catch. Therefore, in general the results presented below should be considered inconclusive in evaluating the effect of the closure contained in Annex 1 of Rec. 08-01. Nevertheless, and based on the analysis carried out by the Tropical Tunas Species Group meeting, the Committee provides the advice below.

The Committee had to make a number of assumptions in order to develop a spatially-structured time series of catch and effort data for the major fleets (EU and Ghana). These data show clearly that the major catches on FADs that were observed in the moratorium area before its 1997-2000 implementations have not been observed during recent years.

Moreover, the first [Rec. 99-01] moratorium substantially reduced the catches of small bigeye for some fleets in the closed area, although this benefit was partially offset by increase catches of small fish, both bigeye and yellowfin, outside the closed area and inside by non-compliant vessels, which makes it difficult to appraise the effectiveness of the past moratorium. The Committee's analyses indicate that, compared to the current closure, the past moratorium reduced the catches made by European and associated fleets on FADs. This conclusion was also supported by a preliminary analysis presented to the Committee examining direct indices of abundance within the moratorium areas.

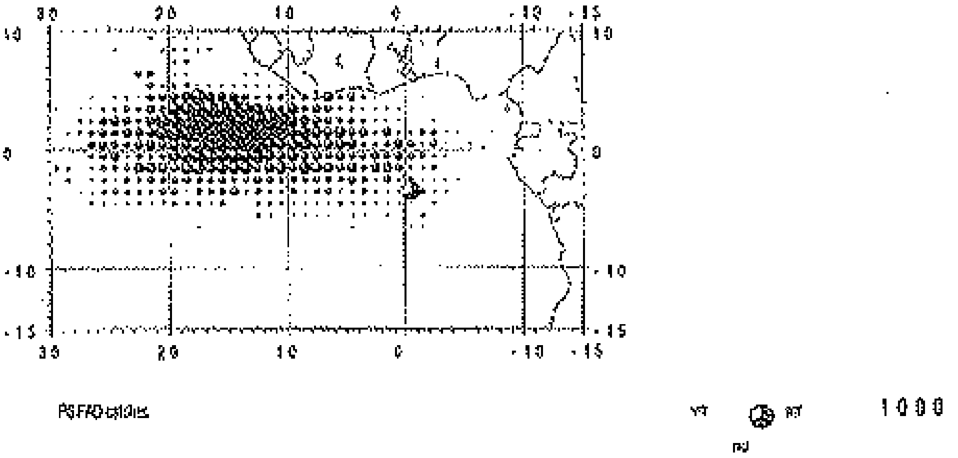
The Committee also conducted per-recruit analyses to address the potential effects of changes in relative effort among gears including changes in FAD effort. The Committee notes that the results of these analyses rely heavily upon the assumed value of natural mortality for small fish, which is highly uncertain. The results of these analyses confirm previous conclusion that modest gains in YPR for yellowfin and bigeye can be obtained by simultaneously considerably decreasing the FAD fishing mortality and noticeably increasing the fishing mortality exerted by the other fleets. The results also show that increases in effective effort levels, particularly that of the FAD fleets, would likely result in substantial reductions in SPR. One implication of these results is that it would be more difficult to maintain spawning stock biomass at high levels under scenarios such as a reallocation of surface fleet effort from other oceans toward the tropical Atlantic. The Committee did not conduct similar analyses for skipjack. However, taking into account the biological characteristics of this species, it was considered that the application of measures such as time-area closure should not produce gains in YPR but should result in foregone skipjack catches that would be proportional to the size of the area closed and the period of closure.

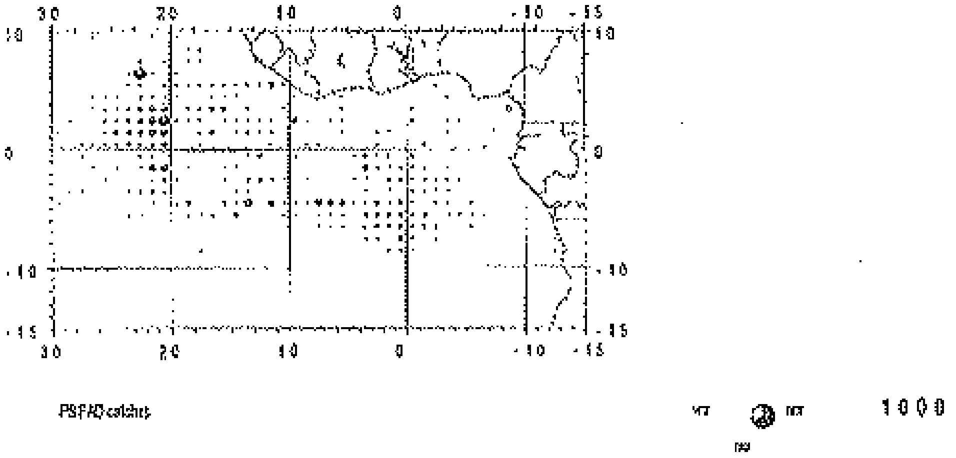
Additional analysis of the European surface fleet performance before and after the various moratoria that have been agreed was undertaken as a way to evaluate the potential effects of the alternative time-area closure defined in [08-01]. Regarding the voluntary time-season closure and the ICCAT recommendations (98-01, 99-01) they appeared to fulfill the objective of reducing sets on FADs and therefore a decrease on their catches, especially the juveniles (**Figure 1**). Regarding the ICCAT recommendation 04-01, inside this moratorium the EU purse seine fleet did not make fishing activities inside the closure area once the closure entered into force, fulfilling this objective. However, the moratorium was not large enough, both the length of time and the surface area to noticeably reduce fishing activities.

There was high presence of the fleet during the proposed months to the left side outside the proposed area in [08-01]. This could result in an increase of fishing effort with the use of FADs around the area. Extending the proposed area westward might improve the efficacy of this proposed time-area closure (**Figure 2**).

An evaluation of the available tagging data from the periods before and during the moratoria was also conducted. The amount of tag and recapture information from these periods was not sufficient to draw any firm conclusions regarding the efficacy of the different moratoria. Additional large-scale tagging experiments would be required to address this question.

As previously noted, the Committee is unable to provide a comprehensive and quantitative evaluation of the proposed closure described in Annex 1 of Rec. 08-01 due to the limitations described previously. Work planned for 2011 to reexamine in detail the Ghanaian data may provide an improved basis for this evaluation. However, there is a general agreement that larger time/area FAD moratoria are likely to be more precautionary than a smaller FAD moratoria, providing that reductions in juvenile mortality are necessary to achieve management objectives and observers are present to verify the compliance with any FAD moratorium.





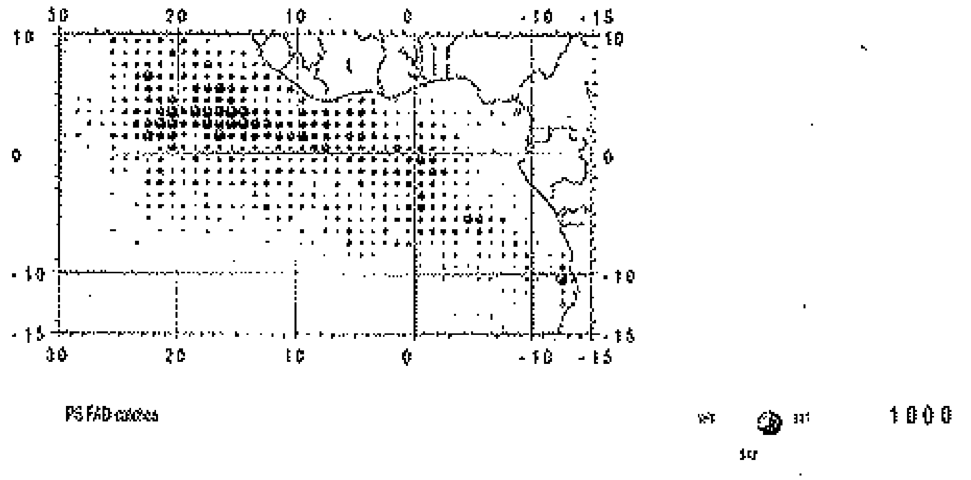



**Figure 1.** Distribution of European purse seine catches under FADs before the moratorium on FADs (1991-1996), during the voluntary moratorium on FADS (1997-2000), and between 2001 and 2008.

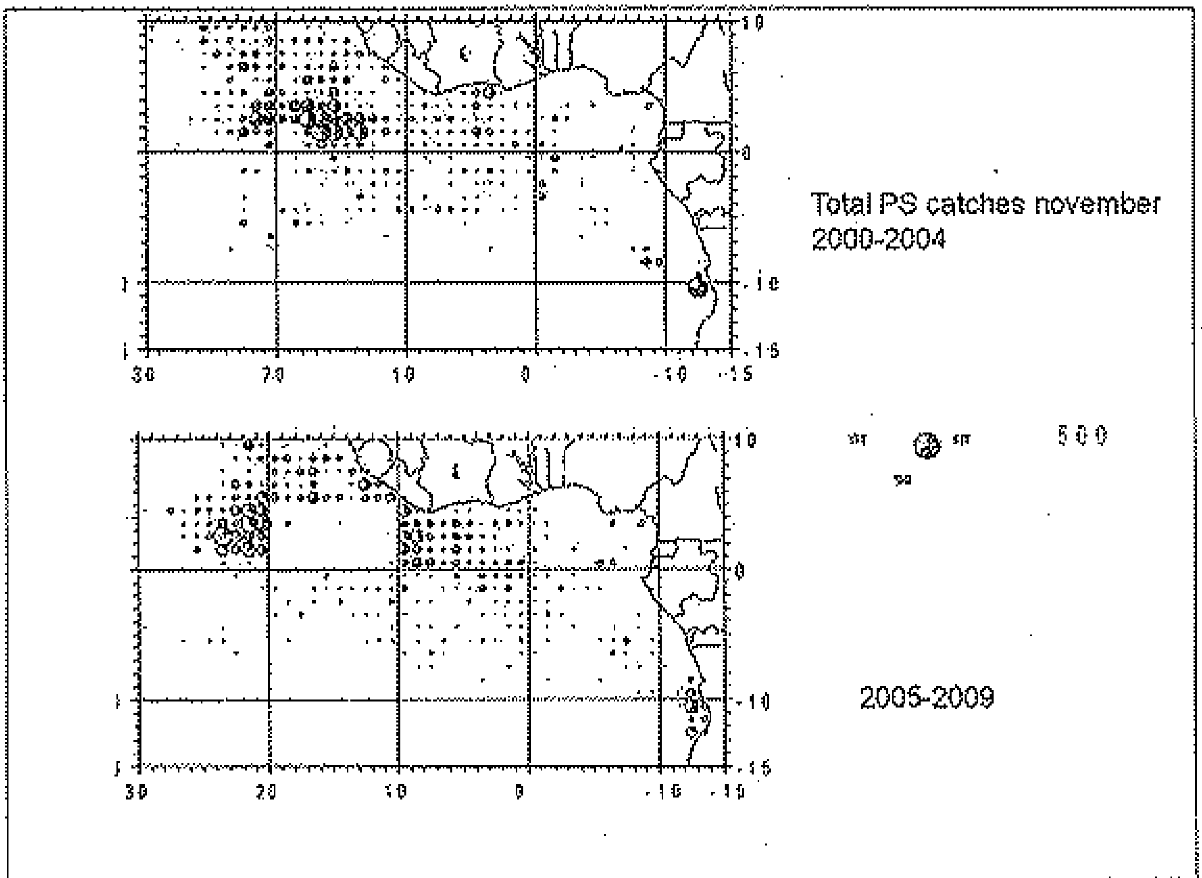



Figure 2. Area distribution of the total catches taken by European purse seiners before (2000-2004) and after (2005-2009) the implementation of the full complete to the surface fishery in the so called Piccolo in the month of November.

*16.8 Reporting on the bluefin scientific data coverage level achieved by each Contracting Party observer program [Rec. 08-05]*

The 2008 *Recommendation Amending the Recommendation by ICCAT to Establish a Multi-annual Recovery Plan for Bluefin Tuna in the Eastern Atlantic and Mediterranean* [Rec. 08-05], established two observer programs, one for Contracting Parties to implement, and a Regional one for the Secretariat to manage.

The Recommendation states that the Commission will develop a set of requirements and procedures that, taking into account Contracting Party confidentiality requirements, will allow the data collected under these programs to be provided to the SCRS. Furthermore, for the scientific aspects of the program, the Recommendation asks the SCRS to report on the coverage level achieved by each Contracting Party, to summarize the data collected, and to make recommendations for improvement.

*16.8.1 Regional Observer Program (ROP-BFT)*

– Vessels

Target observer coverage is 100% on purse seine vessels over 24 m during the entire annual fishing season and on all purse seiners involved in joint fishing operations. In addition, observers shall be present during all transfer of bluefin tuna to and harvest from the cages. The Recommendation entered into force after the 2009 purse seine fishing season, and therefore Contracting Parties were asked to use their own Contracting Party observer programs if they wished to fully implement the provisions of this Recommendation even before it was officially in force.

A call for tenders was issued in September 2009 with a view to awarding the contract before the 2010 fishing season. A consortium was selected and contracted for the implementation of the programme on both vessels and farms.

Observers were recruited and trained for deployment on 94 vessels as follows:

| *Flag vessel* | *Observers* |
|---|---|
| Croatia | 12 |
| EU | 24 |
| Korea | 1 |
| Libya | 17 |
| Morocco | 1 |
| Tunisia | 21 |
| Turkey | 18 |

Two of these vessels (one Libyan and one Turkish) did not fish due to technical problems. At the time of writing, most observers had disembarked from their vessels and are currently undergoing debriefing.

The data obtained from the vessel observer program has, thus far, little, if any, scientific value, since observers are principally concerned with monitoring compliance with the requirements of [08-05]. Recommendations below, if they are implemented in 2011 and beyond could result in significant information in support of stock assessments (see Recommendations).

– Farms

Rec. [08-05] also calls for the ROP to have observers in farms during all caging and harvests. In 2009, the Secretariat implemented the programme for harvests for two Contracting Parties. In 2009, some CPCs participated in the ROP for farms and scientific data were collected and provided to ICCAT. These data, from Croatian and Turkish farms, have not yet been fully incorporated into the assessment databases, since they were delivered to the Secretariat in late September, 2010. In the future, the scientific data collected through these programs should be reported in a more timely manner and adhere to the established reporting deadlines for Task I and Task II reports. In 2010, four Contracting Parties have indicated their intention to participate (Croatia, EU, Tunisia and Turkey). Some harvests have been covered and deployments for caging are currently ongoing. Some raw data are available but to date is incomplete. Size samples have been collected during the harvests. The data are sent to the Contracting Parties concerned and can be included in the Task II submissions as required by Rec. 08-05.

*16.8.2 Contracting Party Observer Program*

The national Observer Program requires the following coverage levels:

20% of active PS between 15-24 m
20% active trawlers
20% active LL
20% active BB
100% harvesting traps

By the 2010 SCRS meeting (Bluefin Tuna Data Preparatory Meeting) only Japan and Morocco provided the coverage levels (20.1% for Japan and 100% for Moroccan traps) of its national Observer Programs (SCRS/2010/066, Annual 025). For the rest of CPCs some information is available on their target coverage levels, but not about the actual coverage achieved or the data collected

*Recommendations*

In order to facilitate the reporting of observer coverage achieved by Contracting Parties, the Committee continues to recommend that the Secretariat develop appropriate reporting forms taking into account the Sub-Committee on Ecosystems and the Kobe II By-catch reports for 2010, and that it request CPCs to provide the information. At a minimum, the information that should be recorded by observers includes species identification, quantity, size, and fate, as well as the ratio of observed to exerted fishing effort. It is also recommended to record catch of all species so as to have a complete characterization of total removals.

The SCRS also believes that it may be useful for the Commission to consider the *"Suggested Rules and Procedures for the Protection, Access to, and Dissemination of Data Compiled by ICCAT"* (Appendix 10 of the 2009 SCRS Report), as these may assist the Commission in its development of requirements and procedures for the submission of observer data.

Furthermore, the Committee continues to recommend that the Commission require scientific work from observers in both the Contracting Party Observer Program and in the ROP (paragraph 88 and Annex 7 of Rec. [08-05] state that "*...the observer shall carry out scientific work, such as collecting Task II data, when required by the Commission, based on the instructions from the SCRS*"). Such scientific work should cover the following:

- Representative size samples
- Catch and fishing effort information
- Access to biological samples when feasible
- In general, activities in support of the Bluefin Research Program (GBYP)

**17. Other matters**

*17. Continued Involvement with ISSF*

The International Seafood Sustainability Foundation (ISSF) is an NGO formed by some of the major tuna canning interests and WWF, which aims to undertake science-based initiatives for the long-term conservation and sustainable use of tuna stocks. ISSF invited Dr. Gerald Scott to become a member of their Scientific Advisory Committee. The role of the Advisory Committee, conformed by scientists who are familiar with the various tuna RFMOs, is to review a scientific report that is written by ISSF ensuring that it is consistent with the scientific assessments produced by the RFMOs. Dr. Scott participated in a meeting of the Scientific Advisory Committee on April 13-16 in La Jolla, USA. In addition, ISSF participating companies have been providing data on catches directly to ICCAT (and other FMOs) and, as indicated in a letter received on October 1, 2010 (Appendix 1), it is the intention of ISSF in providing these data sets for them to be used in a meaningful way by the RFMO scientific bodies. In order for national scientists to conduct the analysis needed to improve the working of the

Scientific Committee as part of the ICCAT process, ISSF suggested that a *mechanism* that allows to access the data in a manner that maintains confidentiality, and within the frameworks that have already been established (*i.e.*, ICCAT working group for tropical tunas, *etc.*) should be developed to support these research initiatives.

The Committee noted that some national scientists would like to access the cannery data that ISSF-participating companies are submitting to the Secretariat. This would be extremely useful in several ways. For example, in cases where those national scientists have vessel logbooks which could be matched with the cannery information on a trip-by-trip basis, thus allowing for improved estimates of catches by species. Such work will be necessary to complete the 2011 work plan for tropical tunas and for this reason, the Committee encourages development of mechanisms that will allow these national scientists to access the data while protecting the confidential components of the ISSF data submissions. A framework for such a mechanism was discussed and adopted by the 2009 SCRS (see Attachment 2 to Addendum 3 in the 2009 SCRS Report).

**18. Election of the Chairman**

Brazil nominated Dr. Josu Santiago (EU) as chair of the SCRS, the nomination was seconded by Ghana. Dr. Santiago was elected unanimously. The new SCRS Chair thanked everyone and stated that he had been rapporteur for albacore in the past but had to leave the SCRS when he became involved in management. However he has been attending the Commission meetings and noted the increase in the work load of the SCRS, although he had not expected to take on the challenge and responsibility of the SCRS chairmanship. He thanked all the Chairs who had preceded him and stated that being Chair of the SCRS would be a challenge and that he would appreciate the support and help of the SCRS and the Secretariat.

The outgoing Chair, Dr. Jerry Scott, thanked everyone for their support during his chairmanship and offered his help to the incoming Cair if needed. The Executive Secretary noted that it was difficult to say goodbye and expressed his appreciation for the great contribution that Dr. Scott had made during his chairmanship. Dr. Scott had chaired the SCRS well, and in particular had been very successful in conveying results to others. He was key in the development of the Kobe matrix, which should really be called the "Scott matrix". He wished him good luck and hoped to still see him at the meetings of the SCRS. Finally the Executive Secretary welcomed Dr. Santiago and stated that he will have the support of the Secretariat. He then presented Dr. Scott with an engraving of a bluefin tuna trap.

Finally, Dr. Alain Fonteneau praised the quality of the work done by the ICCAT Secretariat, particularly the website and the Statistical Bulletin. He remarked on the miraculous efficiency of the Secretariat compared with elsewhere. Dr. Jerry Scott also praised the work of the Secretariat, not just those who work first hand with the SCRS, but also those who actively work behind the scenes, including the interpreters.

**19. Adoption of Report and closure**

Appendix 1

## STANDING COMMITTEE ON RESEARCH AND STATISTICS (SCRS)

*(Hotel Velázquez, Madrid, October 4-8, 2010)*

## AGENDA

1. Opening of the meeting
2. Adoption of Agenda and arrangements for the meeting
3. Introduction of Contracting Party delegations*
4. Introduction and admission of observers*
5. Admission of scientific documents
6. Report of Secretariat activities in research and statistics
7. Review of national fisheries and research programs**
8. Executive Summaries on species including the Kobe matrix with the corresponding levels of catch for bluefin and bigeye tunas [Res. 09-12]:

   YFT-Yellowfin, BET-Bigeye, SKJ-Skipjack, ALB-Albacore, BFT-Bluefin, BIL-Billfishes, SWO-Atl. Swordfish, SWO-Med. Swordfish, SBF-Southern Bluefin, SMT-Small Tunas, SHK-Sharks
9. Report of inter-sessional meetings
   - 9.1 Working Group on Stock assessment methods
   - 9.2 Bigeye Data preparatory meeting
   - 9.3 Blue Marlin Data Preparatory meeting
   - 9.4 Inter-Sessional Meeting of the Sub-Committee on Ecosystems
   - 9.5 Mediterranean swordfish Stock Assessment
   - 9.6 Mediterranean albacore Data Preparatory meeting
   - 9.7 Bigeye Stock Assessment session
   - 9.8 Bluefin Data Preparatory meeting
   - 9.9 Bluefin Stock Assessment session
10. Report of Special Research Programs
    - 10.1 Atlantic Wide Research Programme for Bluefin tuna (GBYP)
    - 10.2 Enhanced Research Program for Billfish
11. Report of the Sub-Committee on Statistics
12. Report of the Sub-Committee on Ecosystems
13. A Consideration of implications of the Tuna RFMOs workshops held in 2010 in Barcelona and Brisbane.
14. Consideration of plans for future activities
    - 14.1 Annual Work Plans
    - 14.2 Inter-sessional meetings proposed for 2011
    - 14.3 Date and place of the next meeting of the SCRS

15. General recommendations to the Commission

    15.1 General recommendations to the Commission that have financial implications

    15.2 Other recommendations

16. Responses to Commission's requests***

    16.1 Defining a standardized methodology for the collection of sport and recreational fisheries data for all species under the ICCAT mandate, including estimates of post-release mortality and data from sampling, tagging and counting programs.

    16.2 Continuation of the evaluation of data elements pursuant to Rec. 05-09.

    16.3 Identify as precisely as possible BFT spawning grounds in the Mediterranean in view of the creation of sanctuaries Rec. 08-05.

    16.4 Review of information on farmed bluefin tuna growth rates Rec. 06-07 and 08-05.

    16.5 Review of data availability on the interaction of tuna fisheries on seabirds and sea turtles.

    16.6 Review of Ghana's action plan to strengthen the collection of statistical data.

    16.7 Evaluation of the effect of the closure contained in [Rec. 08-01] and alternative closures.

    16.8 Reporting on the bluefin scientific data coverage level achieved by each Contracting Party observer program [Rec. 08-05].

17. Other matters

18. Election of the Chairman

19. Adoption of report and closure

Appendix 3

# LIST OF 2010 SCRS DOCUMENTS

| *Number* | *Title* | *Author(s)* |
|---|---|---|
| SCRS/2010/010 | Report of the 2010 ICCAT Working Group on Stock Assessment Methods (Madrid, Spain, April 21 to 23, 2010). | Anonymous |
| SCRS/2010/011 | Report of the 2010 ICCAT Bigeye Tuna Data Preparatory Meeting (Madrid, Spain - April 26 to 30, 2010). | Anonymous |
| SCRS/2010/012 | Report of the 2010 ICCAT Blue Marlin Data Preparatory Meeting (Madrid, Spain - May 17 to 21, 2010). | Anonymous |
| SCRS/2010/013 | Report of the 2010 Inter-sessional Meeting of the SCRS Sub-Committee on Ecosystems (Madrid, Spain - May 31 to June 4, 2010). | Anonymous |
| SCRS/2010/014 | Report of the 2010 ICCAT Bluefin Tuna Data Preparatory Meeting (Madrid, Spain - June 14 to19, 2010). | Anonymous |
| SCRS/2010/015 | Report of the 2010 ICCAT Mediterranean Swordfish Stock Assessment Meeting (Madrid, Spain - June 28 to July 2, 2010). | Anonymous |
| SCRS/2010/016 | Report of the 2010 ICCAT Mediterranean Albacore Data Preparatory Meeting (Madrid, Spain - June 28-July 2, 2010). | Anonymous |
| SCRS/2010/017 | Report of the 2010 ICCAT Bigeye Tuna Stock Assessment Session (Pasaia, Gipuzkoa, Spain - July 5 to 9, 2010). | Anonymous |
| SCRS/2010/018 | Report of the 2010 ICCAT Bluefin Tuna Stock Assessment Session (Madrid, Spain - September 6 to 12, 2010). | Anonymous |
| SCRS/2010/019 | An evaluation of changes in stock productivity and consequences for management. An example based on North Atlantic albacore (*Thunnus alalunga*). | Kell, L.T and Fromentin, J.M. |
| SCRS/2010/020 | Standardized catch rates for blue marlin (*Makaira nigricans*) from the Venezuelan pelagic longline fishery off the Caribbean Sea and the western central Atlantic: Period 1991-2009. | Arocha, F. and Ortiz, M. |
| SCRS/2010/021 | Catch rates for blue marlin (*Makaira nigricans*) from the small scale fishery off la Guaira, Venezuela: Period 1991-2009. | Arocha, F., Medina, M., Barrios, A., Ortiz, M. and Marcano, L.A. |
| SCRS/2010/022 | Bigeye (*Thunnus obesus*) by-catch estimates from the albacore Spanish surface fishery in the North East Atlantic: years 2007-2009. | Ortiz de Zárate, V., Perez, B. and Ruiz, M. |